

LAKE LEMON WATERSHED MANAGEMENT PLAN

LAKE LEMON CONSERVANCY DISTRICT

JANUARY 2002

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MALCOLM PIRNIE, INC. 8440 Woodfield Crossing Boulevard, Suite 175 Indianapolis, Indiana 46240-4300 MALCOLM PIRNIE, INC. 1900 Polaris Parkway, Suite 200 Columbus, Ohio 43240-2020



Lake Lemon Conservançy District

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We, the members of the Lake Lemon Conservancy District Board of Directors, on the 16th day of January 2002, do hereby approve and agree to pursue recommendations for implementation of this Lake Lemon Watershed Management Plan prepared by the Lake Lemon Watershed Planning Committee.

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DENNIS FRIESEL, TREASURER

LARRY ŘITTER, DIST. II

MARTY MANN, VICE-CHAIR.

FRANK FLESER, DIST. I

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ROBERT MADDEN MANAGER

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ACKNOWLEDGEMENTS

Development of the Lake Lemon Watershed Management Plan was accomplished because of the commitment and cooperation of many watershed stakeholders. Numerous individuals and organizations provided assistance during the development of this report.

Special recognition is warranted however, for the following:

- ➤ Indiana Department of Environmental Management provided funding for the development of the Lake Lemon Watershed Management Plan from the Clean Water Act, Section 104(b)(3) Grant # CP975064-01;
- ➤ Paul Amico who provided leadership during the initial phases of this project; and
- ➤ Ethel Wilkerson who provided expert knowledge of the watershed characteristics and facilitated project resources among multiple partners.

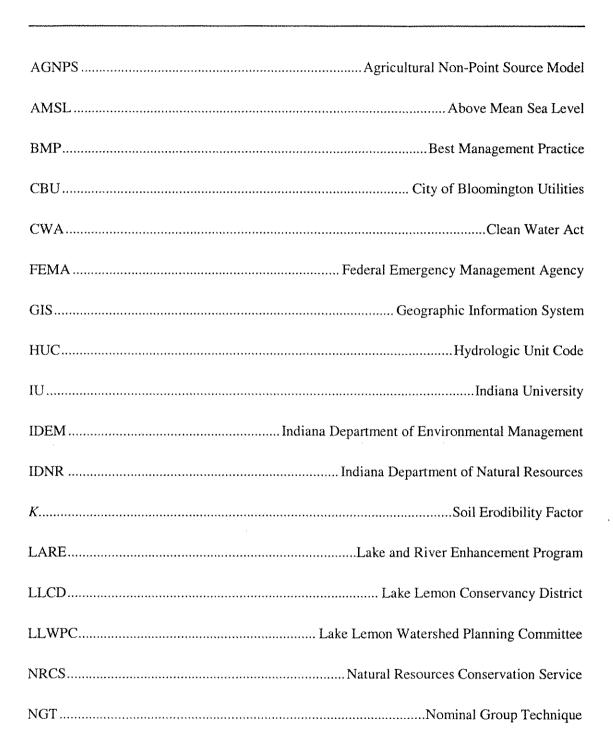
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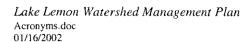
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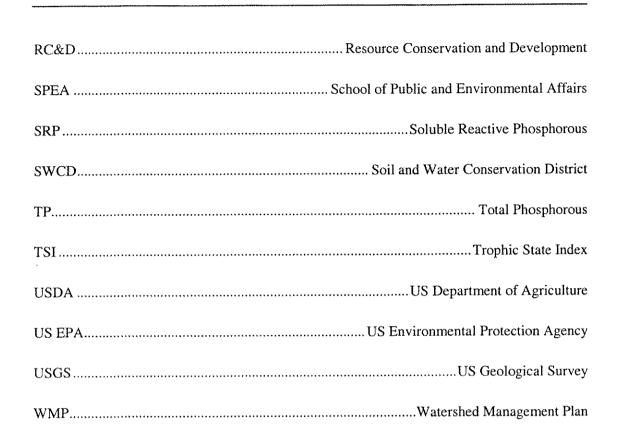
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LIST OF ACRONYMS





LIST OF ACRONYMS (CONTINUED)



The Lake Lemon Watershed Management Plan (WMP) was developed to address water quality concerns, specifically excessive sedimentation in the eastern region of Lake Lemon. This report outlines a plan for action to restore and protect water resources of the Lake Lemon watershed. Objectives of the management plan are to enhance stakeholder knowledge, identify and prioritize issues of concern, develop a consensus for action, and enable both public and private stakeholders to be eligible for restoration program funding. The watershed management approach will yield cost-effective and long-term solutions that reduce non-point sources of pollution in the Lake Lemon watershed.

Lake Lemon is situated in portions of Monroe and Brown Counties near Unionville, Indiana. The reservoir was constructed in 1956 to provide the City of Bloomington its primary source of drinking water. Today, Lake Lemon is used for recreation and as an alternative drinking water supply for the City of Bloomington. The reservoir's watershed encompasses 71 square miles, with 51% forested and only 6% cultivated for agriculture. Steep slopes and highly erodible silt loam soils that are found in the Beanblossom Creek corridor contribute to persistent sedimentation in Lake Lemon.

The Lake Lemon Watershed Planning Committee (LLWPC) was organized in 1999 to oversee the development of the watershed management plan. Both public and private stakeholders participated in the planning process. Citizens identified and prioritized six critical water quality issues of concern.

These publicly identified and prioritized issues of concern include:

- > Reservoir sedimentation;
- Over abundant aquatic vegetation;
- > Failing septic systems;
- Streambank erosion;

- > Bacterial contamination; and
- > Flooding.

The watershed restoration plan with specific recommendations for immediate action include:

- Convene Watershed Steering Committee no direct costs;
- ➤ Obtain necessary permits for the Lake Lemon east end sedimentation/ restoration project – estimated project construction costs are \$2.2 million;
- ➤ Submit an application to the Indiana Department of Environmental Management for Clean Water Act Section 319 grant for a streambank stabilization and demonstration project estimated demonstration project costs are \$250,000; and
- Submit an application to the Federal Emergency Management Agency for a Hazard Mitigation Grant Program for a flood impact and mitigation study – estimated project costs are \$250,000.

1.1 OBJECTIVES

The Lake Lemon Watershed Management Plan (WMP) was developed to address water quality concerns affecting the conditions and use of Lake Lemon and its watershed. The Lake Lemon Watershed Planning Committee (LLWPC) was organized to facilitate technical review and public participation during the development of the WMP.

Objectives of the Lake Lemon WMP include:

- Summarize key watershed physical features, conditions and land use activities;
- Identify and prioritize watershed issues of concern;
- Recommend potential solutions with estimated costs;
- Develop a watershed restoration plan of action; and
- ➤ Enable watershed stakeholders, both public and private, to become eligible for state and federal conservation and restoration program funding.

1.2 BACKGROUND

Lake Lemon was constructed in 1956 for use as the primary drinking water supply source for the City of Bloomington, Indiana. The Lake Lemon watershed is located in Central Indiana and is the area upstream from the reservoir that drains about 71 square miles of mostly forested land cover (Figure 1). Today, the reservoir is also used for wildlife habitat, boating, fishing, recreation, and as Bloomington's alternate drinking water supply source. In the late 1970's, the reservoir's water quality became noticeably degraded from sedimentation, poor water clarity, and the widespread infestation of Eurasian water milfoil (*Myriophyllum spicatum*).

In 1995, local residents organized and formed the Lake Lemon Conservancy District (LLCD) to restore the safety, welfare and recreational value of the reservoir. LLCD desires to restore navigation, recreation, aesthetics and water quality by restoring sediment laden portions of the reservoir's eastern region end and several coves. LLCD recognizes that dredging the sediment only corrects the symptom, but does not protect the reservoir from further sedimentation. LLCD, City of Bloomington Utilities (CBU), and the Indiana Department of Environmental Management (IDEM) collaborated to develop a watershed management plan that outlines a complementary plan of action to restore, protect and prevent further soil erosion in the Lake Lemon watershed.

1.3 PROJECT SCOPE

Primary tasks to develop the Lake Lemon Watershed Management Plan include the following:

- ➤ Task 1 Organize watershed planning team;
- ➤ Task 2 Conduct public awareness campaign;
- ➤ Task 3 Conduct watershed characterization;
- ➤ Task 4 Identify and prioritize issues of concern;
- Task 5 Identify possible solutions and associated costs; and
- ➤ Task 6 Select Solutions Through Consensus.

2.0 WATERSHED CHARACTERIZATION

2.1 BRIEF HISTORY

Early settlers in the 19th Century tried to cultivate and farm the steeply sloping and highly erodible rocky soils of the Upper White River watershed. Unlike the gently rolling and more productive soils of the Lower White River drainage basin, the steep slopes in the upper watershed were abandoned for agricultural purposes. The watershed's agriculturally productive soils are mostly found along the gently sloping terrain directly adjacent to Beanblossom Creek and tributaries. Most agricultural land is used for hay or small grain with a limited amount of row crop production. Beginning in 1929, much of the steeply sloping and eroding abandoned land was purchased by the state of Indiana. Since then, about 5,000 acres of the most severely degraded landscape was reclaimed, reforested and resulted in the formation of Yellowwood and Morgan-Monroe State Forests (IDEM, 2001).

2.2 LAKE LEMON

Lake Lemon is a 1,650-acre reservoir situated in portions of Monroe and Brown counties near Unionville, Indiana (Figure 2). The reservoir is oriented length-wise east to west and segmented in three regions by Riddle and Reed Point peninsulas. The reservoir's 14.9 miles of shoreline encompass an average 4.5 billion gallons of water. Lake Lemon is relatively shallow with an average depth of 9.7 feet and maximum depth of 28 feet near the dam. A dam and spillway are located at the reservoir's western end at an elevation of 630 feet above mean sea level (Zogorski et al., 1986).

Excessive Eurasian water milfoil (*Myriophyllum spicatum*) impacted as much as 75% of the reservoir's surface area especially in shallow areas less than ten feet deep. About 100 surface acres of the reservoir's eastern region is filled in with sediment from

Beanblossom Creek (Appendix A; Photo 1). Lake Lemon's water quality is degraded by dense aquatic vegetation, seasonally elevated levels of phosphorous, suspended sediments, and isolated areas of elevated fecal coliform bacteria concentrations (Jones, 1992; Jones and Clark, 200; and Hoffman, 2000). The reservoir's water quality impairs recreational uses, aesthetics, safety and water quality standards as a potential drinking water supply source for the City of Bloomington (Jones, 1992).

2.3 LAKE LEMON WATERSHED

The Lake Lemon watershed is located near Central Indiana (Figure 1). The watershed encompasses about 71 square miles in portions of Monroe and Brown Counties, with less than 1% or only 0.2 square miles in Johnson County. The majority of the land area is located in Brown County with 62.5 square miles (87.9%) in the watershed. Only 8.4 square miles (11.8%) of the drainage basin is located in Monroe County (Table 1).

The Lake Lemon watershed is classified as an 11-digit hydrologic unit code (HUC) and numbered 05120202-010¹. The Lake Lemon watershed is comprised of four separate smaller sub-watersheds (14-digit HUC). These sub-watersheds range from 13 square mile for the North Bear Fork Beanblossom Creek to as much as 21.4 square miles for lower Beanblossom Creek – Lick/ Bear Creek sub-watershed. Both the Beanblossom Creek Headwaters and Lake Lemon sub-watersheds are about the same area of 18.4 square miles (Table 1).

¹ Hydrologic Unit Code (HUC) is a hierarchical hydrologic classification system developed by the US Geological Survey, Water Resources Council. Each hydrologic unit is identified by a unique hydrologic unit code (HUC) consisting of two to fourteen digits based on the levels of classification in the hydrologic unit system (Seaber et al., 1987). Small drainage basins have larger HUC classification codes and larger watersheds have smaller HUC codes. For example, the Ohio River basin is a regional two-digit HUC (05) and the Lake Lemon Watershed is a 11-digit HUC.

2.3.1 Beanblossom Creek

Beanblossom Creek originates near the town of Spearsville, Indiana in Brown County. The stream flows southerly to the confluence with East Fork Creek, north of State Road 45. At this junction, Beanblossom Creek flows westerly through the towns of Beanblossom, Helmsburg and Trevlac before discharging into Lake Lemon. Beanblossom continues at the outflow of the Lake Lemon spillway located on the northwest end of the reservoir where it flows north and discharges into Honey Creek (IDEM, 2001).

2.3.2 Ecoregion

The Lake Lemon watershed is situated within the Norman Upland ecoregion. This ecoregion is characterized by unglaciated, deeply dissected hills with narrow valleys, and medium to high stream gradients. Native vegetation was Oak-Hickory forest on uplands, and Beech forest in the valleys. The current land use is typically forested with Oak, Virginia pine, and Beech-Maple (IDEM, 2001).

2.3.3 Climate

The climate of Central Indiana is characterized as humid continental with temperatures fluctuating between seasons. Average annual precipitation is approximately 42 inches with an annual average of 12 to 14 inches of runoff. Annual average snowfall is 14 inches. Temperatures range between and average low of 19° F to 38° F in January to an average high of 64° F to 87° F in July (IDEM, 2001).

2.3.4 Topography

The Lake Lemon watershed is typified as hilly and rugged with steep slopes that drain into V-shaped ravines or narrow valleys with relatively flat bottoms (Zogorski, 1986). Lake Lemon watershed elevations range from approximately 600 feet above mean sea level (AMSL) near the reservoir's dam, to as high as 1,050 feet

AMSL on the extreme southeastern rim of the watershed at the headwaters of East Fork Beanblossom Creek (Figure 3).

Slopes in the watershed range from relatively flat (less than 5%) along lower Beanblossom Creek, to slopes greater than 20% along the northern periphery of the watershed. Slopes between 5-10% are most prevalent throughout the watershed (Table 2). Some of the steeper slopes are found directly around Lake Lemon (Figure 4). The highest percent, 2.2%, of slopes steeper than 20% are found in the Lower Beanblossom Creek – Lick/Bear Creeks sub-watershed (Table 2).

2.3.5 Soils

There are four major soil associations in the Lake Lemon watershed (Figure 5):

- Berks-Wellston-Trevlac;
- Stendal-Haymond-Steff;
- Pekin-Chetwynd-Bartle; and
- ➤ Hickory-Cincinnati-Rossmoyne associations.

A common characteristic among all the soils of the watershed is their relatively high soil erodibility. The soil erodibility factor, K, provides an indication of the inherent erodibility of the soil. Soil erodibility is directly related to a soil's infiltration capacity and structural stability. Soils with K factors exceeding 0.3 are classified as being more easily eroded with low infiltration rates (Brady, 1990). All generalized soil associations in the Lake Lemon watershed have soil erodibility ratings greater than 0.37.

The Berks-Wellston-Trevlac soils association represents about 49.6% (35.3 mi²), of the Lake Lemon watershed (Table 3). The distribution of these soils is varied and can be found along the watershed's southern border and larger portions in the northwest region. A small section (6.9mi²) is located in the extreme eastern portion of

the Beanblossom – Headwaters sub-watershed (Figure 5). Berks-Wellston-Trevlac soils are moderate to steeply sloping, well-drained soils. They are formed from wind deposited and weathered material and originate from shale, siltstone, and sandstone material. The average erodibility value for this association is 0.3, and ranges between 0.17 for Berks soils to 0.37 for Wellston and Trevlac soils (USDA, 1990).

The Stendal-Haymond-Steff soil association covers only 4.3mi^2 (6.0%) of the Lake Lemon watershed (Table 3). However, these highly erodible soils are situated along the low-lying flood plain corridor of Beanblossom Creek (Figure 5). The Stendal soil series is deep, somewhat poorly drained, moderately permeable soil found on flood plains. These soils were formed in silty alluvial deposits on slopes less than 2% (USDA, 1990). The Stendal soil association has an average K of 0.38. Therefore, the lower Beanblossom Creek stream channel is situated in soils highly susceptible to erosion.

2.3.6 Land Cover

The Lake Lemon watershed is mostly forested, especially in the southern and western regions (Figure 6). Forests represent about 71.7% (51.0mi²) of the watershed area (Table 4). Forested land is distantly followed by agricultural land use where pasture and row cropland combined represents only 23.2% of the watershed (16.5 mi²). Brown County ranks 91 out of 92 Indiana Counties for corn and soybean production, and ranks 78th in hay production (USDA, 1997; and IDEM, 2001). Pasture and hay production are more common than row crop agricultural where both are typically cultivated in the flat narrow flood plain valleys (Figure 6). Livestock production in Brown County ranks last of all 92 Indiana Counties (USDA, 1997; and IDEM, 2001).

2.3.7 Land Ownership

More than 90% (64.2 mi²) of the Lake Lemon watershed is privately owned (Table 5). Most of the publicly owned land is located on forested land toward the

western region of the watershed (Figure 7). Morgan-Monroe and Yellowwood State Forests comprise about 4,399.6 acres, only 9.7%, of the watershed. The Lick /Bear Creeks sub-watershed has the highest percentage of state forest property (32.7%). Yellowwood State Forest represents the majority of parkland at 3,764.8 acres (85.6%) of all State of Indiana owned property in the watershed (Table 5).

2.3.8 State Forests

Yellowwood State Forest is named for a tree common in the middle-south region of the continental United States but rare in the northern latitude of Indiana. The yellowwood tree (*Cladrastic kentukea*) has bright yellow heartwood that is hard and dense. The tree flowers abundantly but only every three to five years in the spring. Less than 200 acres in the forest support the yellowwood tree on north facing slopes and deep ravines near the Crooked Creek Lake. The forest was created in 1940 by the federal government which deeded the land to Indiana in 1956. During this period of time, over 2,000 abandoned and eroded acres were planted to pine, black locust, black walnut, white and red oak (IDEM, 2001).

Morgan-Monroe State Forest was established in 1929 and lies in the northeast corner of Monroe County (Figure 7). Primitive camping, hiking, fishing, horse trails and hunting are permitted in both parks. Panning for gold is also permitted but the use of a pick, shovel or sluice is not allowed because of the concern for the impact to water quality (IDEM, 2001).

2.3.9 Population

About 14,100 people lived in Brown County in 1990 and only an additional 800 people moved into the county between 1990 and 2000. Brown County population is expected to grow marginally 2.12% to 14,400 by 2020. Monroe County however, is projected to increase 20.3% from 118,900 people in 2000 to an estimated 131,100 people by 2020 (IDEM, 2001).

2.3.10 Wastewater Treatment Plants

Four sewage treatment plants are located throughout the Lake Lemon watershed (Figure 8). These plants treat and seasonally discharge a cumulative average flow of 0.04 million gallons per day (mgd), or approximately 40,000 gallons per day (gpd) (Table 6). The small seasonal discharges from these systems suggest their impacts are negligible on receiving streams (Jones, 1992).

3.0 LAKE LEMON CONSERVANCY DISTRICT

3.1 CONSERVANCY DISTRICT FORMATION

During the early 1990's, residents and property owners living near Lake Lemon became concerned that the City of Bloomington Utilities (CBU) would abandon, close or even drain the reservoir. Residents were concerned for the health, safety and welfare of those who use and benefit from the recreational value of the reservoir (LLCD, 1996). In 1995, the Circuit Court of Monroe County (Cause Number 53C05-9410-CP-01187) in accordance with the Indiana Conservancy Act IC 14-33 officially formed the Lake Lemon Conservancy District (LLCD).

The purpose of the Lake Lemon Conservancy District is to:

"...include operating, maintaining and improving waterbased recreational opportunities provided by Lake Lemon and developing recreation facilities where feasible in connection with beneficial water management all of which will benefit and be conducive to the health, safety and welfare of the property owners surrounding Lake Lemon and the general public" (LLCD, 1996).

The City of Bloomington Utilities retains ownership of Lake Lemon and leases it to the Conservancy District with the stipulation that the District manage the reservoir consistently with its designated potential use as an alternate drinking water supply source for the City of Bloomington (Jones, 1992). Since 1996, LLCD and CBU have effectively teamed to help restore, enhance and protect the quality of water in Lake Lemon. This partnership has completed an impressive series of projects that include:

- > Fish management survey;
- > Annual water quality monitoring program with Indiana University;
- > Volunteer lake monitoring program;
- Shoreline stabilization projects;
- > An aquatic plant management plan;
- > Exotic invasive aquatic plant control;
- Nuisance wildlife management plan;
- > East End Design Study; and
- > Public education and outreach.

3.2.1 Fish Management Survey

A fish management survey collected and analyzed twenty-seven different fish species (Aquatic Control, Inc., 2001). Results of the survey indicate that yellow bass (28%), blue gill (25%), gizzard shad (14%), white crappie (8%), and largemouth bass (6%) were the most common fish species in the reservoir. The study concluded that the majority of fish populations were balanced and show good levels of reproduction.

Fish management recommendations include:

- Encourage maximum harvest of blue gill and yellow bass species;
- Continue control of Eurasian milfoil;
- Maintain a 14-inch minimum length limit on largemouth bass;
- Reduce the tournament pressure on the fishery;
- Request anglers to complete a creel census form; and
- Continue the development of the watershed management plan to decrease turbidity of the water column.

3.2.2 Water Quality Monitoring

Since 1997, LLCD has contracted with the Indiana University School of Public and Environmental Affairs (SPEA) to monitor and evaluate water quality condition in Lake Lemon. The program monitors the reservoir semi-annually for twelve water quality parameters and determines the lake's Trophic State Index (TSI)². The LLCD provides funds for this program to obtain quality data. Long-term water quality data can be analyzed and provide a better understanding of changes in water quality.

3.2.3 Volunteer Lake Monitoring Program

LLCD participates in the Indiana Clean Lakes Program, Volunteer Lake Monitoring Program. This program utilizes Secchi Disk depth measurements to monitor the reservoir's water transparency. Secchi Disks provide an inexpensive method of measuring water transparency, which is directly affected by the amount of suspended sediments and algae in the water. Transparency data collected biweekly during the summer months is compiled and used to record water quality trends within Lake Lemon.

3.2.4 Shoreline Stabilization

A shoreline stabilization study identified nine sites around Lake Lemon totaling 2,829 linear feet of eroding shoreline requiring immediate restoration (Commonwealth Biomonitoring, Inc., 1997). The study identified one parcel of privately owned property where 444 linear feet of "extreme" shoreline erosion occurred. The property owner has since then, stabilized the shoreline and paid for the restoration costs. The remaining eight sites and 2,385 shoreline feet are owned by the City of Bloomington. In 1997, LLCD and CBU initiated a shoreline stabilization restoration program and have received more than \$300,000 for shoreline stabilization

² TSI is a numerical index representing a lake's productivity status. Higher TSI scores indicate elevated biomass production typically because of higher nutrients in the lake (Jones, 1992).

from the Indiana Department of Natural Resource's (IDNR) Lake and River Enhancement Program (LARE)³. The stabilization of all 2,829 feet of shoreline and an additional 950 feet will be completed by 2002.

3.2.5 Aquatic Plant Management Plan

LLCD facilitated the development of a comprehensive aquatic plant management plan completed in 2000 for the restoration, control and management of abundant nuisance aquatic plants. The goal of the Aquatic Plant Management Plan is to, "...better understand plant management and to blend plant management goals with the recreational and ecological needs of the Lake Lemon community" (Hoffman, 2000). The management plan recommended LLCD use annual chemical control methods to manage nuisance and invasive aquatic vegetation.

3.2.6 Exotic Invasive Aquatic Plant Control

Based on recommendations of early reservoir diagnostic studies, LLCD funds and maintains an annual program that treats dense aquatic vegetation with herbicides. LLCD spends about \$30,000 annually for chemical treatment to help control invasive Eurasian water milfoil, spatterdock and American lotus. In 2000, LLCD received a cost-share grant from IDNR's LARE program to control the growth of Eurasian water milfoil.

3.2.7 Nuisance Wildlife Management Plan

LLCD initiated development of a nuisance wildlife management plan for the control of beaver, muskrat, Canada geese, and zebra mussels. Objectives of the plan were to develop nuisance wildlife management protocols and protect the lake from exotic species' infestations (Wilkerson, 2002).

³ LARE is a statewide conservation program offered by the Indiana Department of Natural Resources, Division of Soil Conservation. The Division provides technical and financial assistance to reduce nonpoint source pollution from entering the state's surface waters.

Recommendations for wildlife management include:

- > Monitoring the presence of nuisance populations;
- > Control of goose populations via annual egg treatments; and
- > Increase nuisance and exotic wildlife management education for reservoir residents and users.

3.2.8 Reservoir Sedimentation/ Restoration Design Study

Based on recommendations of previous reservoir diagnostic studies, LLCD initiated steps to secure state funding for a reservoir sedimentation/restoration preliminary design study (Zogorski et al., 1986; and Jones, 1992). In 1999, LLCD and CBU applied and received a federal Clean Water Act (CWA) Section 104(b)(3) grant from the Indiana Department of Environmental Management (IDEM) for a sedimentation/restoration preliminary design study.

Goals of the study include:

- Address existing sedimentation at the east end of the reservoir and propose
 a method to deal with future sedimentation;
- Improve water quality in the reservoir by relocating existing sediments;
- Restore fish and wildlife habitat; and
- Address navigational concerns by improving the current channel and reopening the original channel (Schneider, 2001).

A series of meetings between Schnieder Corporation, LLCD, IDNR and IDEM were held to review the engineering analyses findings and examine potential solutions. All restoration options were designed with a capacity to retain about 8 to 10 years of sediment at deposition rates of 8,000 to 10,000 cubic yards per year. The recommended reservoir restoration solution recommended is the creation of elevated islands with suitable interior wetlands using a fiberglass piling containment system.

This system is currently used for shoreline stabilization around the reservoir (Schneider, 2001).

3.2.9 Watershed Management Plan

As part of the reservoir sedimentation/restoration preliminary design study, the LLCD also received federal CWA Section 104(b)(3) funding from IDEM to develop a watershed management plan. The purpose of the plan is to better understand causes and sources of sedimentation and identify solutions that restore eroded areas and prevent further erosion. As part of the watershed management planning process, the LLCD and CBU initiated and facilitated the development of the Lake Lemon Watershed Planning Committee (LLWPC). This committee is the organization for watershed stakeholders to participate in the characterization, issues identification, and long-term management of the Lake Lemon watershed.

3.3 EDUCATION AND OUTREACH PROGRAMS

The LLCD participates in variety of education and outreach programs. These programs enable the District to continually provide new information to the community about issues affecting the reservoir and techniques individual citizens can do to help protect Lake Lemon.

3.3.1 Boy Scouts of America

Members of the LLCD staff serve as advisors for Eagle Scout Projects for a Boy Scout Troop that meets regularly on Lake Lemon at the Boys and Girls Club of Bloomington adjacent to Riddle Point Park. LLCD encourages projects that help improve the ecological condition of the lake and the surrounding area. Completed Eagle Scout projects include the stabilization of eroding shoreline around Riddle Point

Park and construction of wood duck nesting boxes that were placed on City of Bloomington property around the reservoir.

3.3.2 Guest Lecturers

LLCD staff conducts guest-lecture presentations for courses at the Indiana University, School of Public and Environmental Affairs. Topics included exotic aquatic plant management, reservoir sedimentation, recreation conflicts, watershed management, and water quality issues affecting Lake Lemon.

3.3.3 Waterfowl Observation Platform

In 1999, the Sassafras Audubon Society partnered with LLCD to build a waterfowl observation platform in the Little Africa Nature Preserve overlooking Lake Lemon. Native grass and sedge species were planted to provide food and habitat for wildlife. LLCD provided the construction material and the Sassafras Audubon Society provided labor to build the observation platform.

3.3.4 Quarterly Newsletters

Lake Lemon Conservancy District publishes and distributes about 500 copies of the Lake Lemon Newsletter to freeholders of the LLCD. The newsletter is published quarterly to inform and educate residents of surrounding Lake Lemon about important issues such as upcoming activities, exotic aquatic species management and best management practices for living near the reservoir.

4.0 LAKE LEMON WATERSHED PLANNING COMMITTEE

4.1 WATERSHED PARTNERSHIP

The Lake Lemon Watershed Planning Committee (LLWPC) was formed in May 2000 to provide direction, assistance, resources, technical review and, most importantly, local knowledge through public participation. Quarterly meetings of the LLWPC were organized to coordinate local resources, technical review and public awareness and participation. Meeting minutes were recorded and are provided in this plan (Appendix C).

4.1.1 Representatives

The LLWPC consists of representatives from local, state and federal agencies, universities and citizens. There were eighteen watershed stakeholder representatives who participated at quarterly meetings at various stages during the development of the watershed management plan (Table 7).

4.1.2 Vision

Lake Lemon is a safe, recreational reservoir capable of meeting drinking water quality needs.

4.1.3 Mission

The mission of the Lake Lemon Watershed Planning Committee is to facilitate development of a watershed management plan and implement recommended water quality restoration and protection measures through effective public and private collaboration.

4.1.4 Objectives

Objectives of the planning committee include:

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- > Identify of the issues of concern;
- > Prioritize of the issues of concern;
- ➤ Identify of technically feasible solutions;
- > Select applicable solutions for the issues of concern; and
- > Provide technical review of the watershed management planning document.

4.1.5 Public Outreach

A fundamental element of a successfully developed and implemented watershed management plan is the participation of the watershed citizenry. Prior to each meeting, the LLWPC advertised planning meeting locations and schedules through local newspapers and the LLCD newsletter. In addition, the LLWPC presented the key findings and issues of concern with the watershed stakeholders at the Brown County public library on August 1, 2001 (Appendix D).

5.0 ISSUES IDENTIFICATION AND PRIORTIZATION

5.1 OVERVIEW

The process of identifying and prioritizing issues of concern for the Lake Lemon watershed involved a review of existing environmental data and reports; input from the Lake Lemon Watershed Planning Committee (LLWPC); and public participation. Existing environmental geo-spatial data was compiled and modeled in a geographic information system (GIS). Results were used to characterize, identify and map critical features of Lake Lemon's watershed. A technical review and analysis of existing studies was summarized and presented to the LLWPC. The LLWPC facilitated watershed tours to investigate and better understand critical areas of concern identified during the technical review. Finally, the watershed public participated in the identification and prioritization of issues of concern. Results of this process were used to document the public's prioritized issues of concern, evaluate potential solutions and develop an implementation plan.

5.2 IDENTIFICATION OF ISSUES OF CONCERN

An interactive presentation that summarized Lake Lemon's watershed features and previously documented issues of concern was delivered to interested stakeholders at the Brown County public library on August 1, 2001 (Appendix D). Following the presentation, representatives of the Hoosier Heartland Resource Conservation & Development (RC&D) used the Nominal Group Technique (NGT)⁴ to identify and later prioritize the watershed community's issues of concern (Appendix E).

⁴ NGT allows a group to quickly come to consensus on the relative importance of issues, problems, or solutions by completing individual importance rankings into a group's final priorities.

Participating Lake Lemon watershed citizens identified a total of 24 issues of concern, recommendations, and potential solutions that ranged from "reservoir sedimentation" to "shoreline erosion funding for private landowners" and "dredging Possum Trot Creek" (Table 8). However, the public later prioritized only eight of the twenty-four as critical water quality issues of concern. Three issues of the originally identified 24 issues were not prioritized and the remaining thirteen (13) issues were recommended as potential solution (Table 9).

5.3 PRIORITIZED ISSUES OF CONCERN

Lake Lemon watershed citizens prioritized only eight of the initial twenty-four issues of concern. Among the eight prioritized concerns, issues five "alternative methods of treating aquatic plants" and number eight "drastic erosion and sedimentation on North Shore Drive and Ice Box Cove" were aggregated into similarly prioritized issues of concern such as the "over abundant aquatic vegetation", "streambank erosion" and "sedimentation".

The watershed citizens identified and prioritized the following critical issues of concern and are:

- > Reservoir sedimentation;
- Overabundant aquatic vegetation;
- > Failing septic systems;
- > Streambank erosion;
- Bacterial contamination; and
- > Flooding.

5.3.1 Reservoir Sedimentation

Results of the public meeting ranked sedimentation of Lake Lemon as the leading issue affecting water quality (Table 9). Since construction of Lake Lemon, as much as 520,000 cubic yards of sediment have accumulated in the reservoir's eastern region (Appendix A: Photo 1). Based on the current 50-year life of Lake Lemon, the sedimentation rate is 8,000 to 10,000 cubic yards per year (Schneider, 2001). Lake Lemon's overall capacity loss rate is 0.17 percent per year; however the capacity loss rate from sedimentation in the eastern region is ten times higher at 1.7 percent per year. This volume loss significantly reduces the reservoirs nominal life rate from 400 years to 80 years. Earlier studies suggest that sedimentation rate in the eastern region of the lake is "great enough to be of concern and requires management" (Zogorski et al., 1986). Causes of excessive sedimentation to the reservoir are derived from agricultural, forestry, construction, streambank and shoreline erosion. Shoreline erosion around Lake Lemon causes significant property damage and contributes to the sedimentation of the reservoir (Appendix A: Photos 4 and 5).

In 1992, the Agricultural Nonpoint Source Model (AGNPS) was used to identify critical erosion areas of concern in the watershed (Jones, 1992). Model results indicate that agricultural land in the upper reaches is a significant source of soil erosion compared to other land uses. The largest relative areal sediment yields were highest in the North Fork Beanblossom Creek sub-watershed above Big Thunder Creek (0.071 tons/ acre) and Hoppers Branch Creek sub-watershed (0.076 tons/ acre). Agricultural land use is more common in both sub-watersheds especially along the stream corridors. AGNPS model results estimated 0.68-tons/acre/ year were derived from soil erosion within the watershed and deposited into the reservoir (Hartke and Hill, 1974). However, the erosion delivery rate is substantially low when compared to a statewide mean annual soil loss rate of 11.3 tons/acre/ year (Wischmeier, 1976). Additional significant sources of sediment were noted, but not quantified, along the mainstem of the Beanblossom Creek streambank corridor (Jones, 1992) Details for streambank erosion assessment are described in Section 5.2.4.

5.3.2 Over Abundant Aquatic Vegetation

The overabundant growth of aquatic vegetation was prioritized as the second most problematic issue affecting the reservoir's water quality (Table 9). In 1986, Eurasian water milfoil (*Myriophyllum spicatum*) was the primary nuisance species affecting recreation, swimming, boating, wildlife viewing and fishing (Appendix A: Photos 2 and 3) (Zogorski et al., 1986). By 2000, three new aquatic plant species were identified as potentially problematic and include the American Lotus, Spatterdock (*Nuphar lutea*) and Purple Loosestrife (*Lythrum salicaria*) (Hoffman, 2000).

Although excessive aquatic vegetation occurs in shallow areas of the reservoir, this problem is more symptomatic of sediment accumulation that enables aquatic vegetation habitat. Sediment provides a favorable rooting media and the shallow conditions allow sunlight penetration for the growth and overabundance of aquatic vegetation (Glander, 1982).

A second feasibility study preformed in 1990 examined changes in Lake Lemon's water quality since the 1986 diagnostic study. The study reiterated the four issues of concern articulated in the earlier diagnostic study (over abundant aquatic vegetation, reservoir sedimentation, shoreline erosion, and elevated fecal coliform bacteria). Unlike the previous study that reported low levels of phosphorous in the water column, soluble reactive phosphorous (SRP), total phosphorous (TP) and ammonia-N (NH₄) had increased since the 1986 study (Jones, 1992). The reservoir's nutrient increase was attributed to the bacterial decomposition by-product of excessive organic matter, resultant low dissolved oxygen concentrations and phosphorous chemical release from the sediment in the reservoir's water column (Jones, 1992). Thus, Lake Lemon's elevated nutrient levels are derived from the existing nutrient bank contained where the nutrients are released by the reservoir's decaying vegetation thereby, becoming both a source and cause of the reservoir's over abundant aquatic vegetation.

Excessive sedimentation from streambank erosion and reservoir shoreline erosion are the leading causes of the favorable environment conducive for aquatic vegetative growth.

5.3.3 Failing Septic Systems

Failing septic systems were ranked as the public's third highest priority issue of concern (Table 9). Improperly installed and poorly maintained on-site septic systems lead to failing systems. Many of the older on-site septic systems were installed when the houses were used exclusively as summer homes. Since then, many homes have become permanent residences resulting in overloading and malfunctioning of septic system's capacity to adequately treat effluent (Zogorski et al., 1986). Moreover, only about 5 percent of Lake Lemon's shoreline soils are classified as moderately suitable for on-site septic systems (Jones, 1992).

Although specific sources could not be traced, previous water quality analytical studies conducted by researchers at the Indiana University identified the Chitwood Addition and lower Beanbloossom Creek areas of the reservoir as exceeding Indiana's water quality standard for fecal coliform bacteria (Zogorski, et al., 1986; and Jones, 1992). A common source of fecal coliform bacteria is derived from inadequately treated sewage effluent. Fecal coliform bacteria contamination is further described in Section 5.2.5.

5.3.4 Streambank Erosion

Streambank erosion is a serious problem in the lower portions of Plum, Possum Trot and Beanblossom Creeks (Appendix A: Photos 11 and 12). The watershed citizens prioritized streambank erosion as the fourth highest issue of concern. However, streambank erosion is potentially the leading source of the sediment to Lake Lemon's east end. Streambank erosion is caused by seasonal high velocity floodwaters that erode and gouge the highly erodible deep and silty alluvial

streambank soils (Jones, 1992). Silty and sandy deposits from the streambank erosion are found in the lower reaches of Beanblossom Creek (Appendix A: Photo 14).

On April 11, 2001, the LLWPC with representatives of IDNR, IDEM and NRCS toured the watershed to examine critical areas in need of restoration. Significant streambank erosion to lower Beanblossom Creek occurs along State Route 45 midway between Trevlac and Helmsburg. The watershed tour group identified this site as in need of immediate restoration because, in part, of the concern for safety from the severe streambank erosion damage to State Road 45. Attempts to protect the road from further damage are evident from the concrete and debris strewn across the streambank (Appendix A: Photos 15 and 16). The LLWPC recognizes that streambank erosion causes not only water quality problems for Lake Lemon but is also a significant safety concern for residents traveling State Route 45 in the Lake Lemon watershed.

5.3.5 Bacterial Contamination

The Indiana fecal coliform water quality standard for full-body recreational water contact is 200 fecal coliform bacteria colonies per 100 mL of water. Stream sample analyses results indicate fecal coliform levels were typically below the state's full body recreational standard. The higher rate of incidences where fecal coliform exceeded water quality standards occurred in Bear Creek and near the mouth of Beanblossom Creek at Lake Lemon (Zogorski et al., 1986). Approximately 105 stream miles are classified as "partially supporting" for swimmable, or full body contact, designated use. The cause of the partial attainment status was attributed to pathogens, e.g. fecal coliform and *E. coli*. However, the source of bacterial contamination causing the partial attainment status was listed as unknown (IDEM, 1998). Four wastewater treatment plants discharge into Beanblossom Creek (Table 6). However, they are considered relatively insignificant to the total nutrient and bacterial contamination to Lake Lemon (Jones, 1992).

Typical Lake Lemon fecal coliform bacteria counts are within the Indiana water quality standards for full-body recreational contact. Scattered and isolated incidences of elevated fecal coliform bacteria were detected near the Chitwood Addition and lower section of Beanblossom Creek that does exceed water quality standards. Specific sources of the fecal coliform bacteria could not be traced (Zogorski et al., 1986, and Jones, 1992). Failing septic systems in the Chitwood Addition area are believed to be sources of the isolated bacterial contamination because of the older on-site septic systems and poorly suitable soils for on-site septic treatment systems (Jones, 1992).

5.3.6 Flooding

The watershed citizens prioritized flooding as sixth issue of concern. Flooding is a concern for public safety in Trevlac and along State Route 45 (Table 9). The seasonal flooding was previously idetnified as a possible cause of the reservoir's sedimentation problem from the flood water's gouging of stream banks (Jones, 1992). A serious flood event causing damage to Trevlac occurred in October 2000 during the development of the watershed management plan (Appendix A: Photos 17 and 18). Discussion of this topic among LLWPC and the public meeting participants led to the understanding that the flooding could be a leading cause of the streambank erosion, reservoir sedimentation and fecal coliform bacteria from runoff of inundated livestock operations (Appendix A: Photo 17). At this time, causes and sources of the flooding are not known and require further study.

6.1 OVERVIEW

Potential solutions to restore, enhance and protect Lake Lemon's water resources from non-point sources of pollution require a dual management approach. In all cases, public education, understanding and participation must be facilitated for successful program implementation. This dual approach includes:

Watershed management: implementation of site specific best management practices (BMPs) within the watershed to prevent on-site and downstream resource degradation, and

In-Lake Restoration: management controls and restoration techniques to improve water quality after it becomes problematic within the reservoir (Zogorski et al., 1986).

This chapter examines a variety of watershed-based and in-lake management practices and strategies that, when implemented, will help Lake Lemon attain desired water quality goals.

6.2 PROGRAMMATIC SOLUTIONS

Collaboration, education and planning were common themes for potential solutions identified and prioritized by the watershed citizens (Table 8). These solutions are more large-scale and programmatic in nature that requires the coordination and cooperation among the various agencies responsible for Indiana's natural resource management.

The watershed citizens identified the following programmatic potential solutions:

Alternative methods of treating aquatic plants;

- > Identify and secure shoreline erosion funding for private landowners;
- > Educate landowners in the watershed;
- > Develop a master plan for Brown and Monroe Counties that addresses water quality legislation;
- Personal practices of land users and effects on water quality;
- > Work with landowners along Beanblossom Creek;
- > Contact leadership with the Federal Emergency Management Agency (FEMA); and
- ➤ Have LLCD work with IDNR, SWCD and NRCS on projects.

A watershed council formed of Lake Lemon watershed stakeholders was proposed as early as 1986 (Zogorski et al., 1986). The Lake Lemon Watershed Planning Committee (LLWPC) was organized, in part, because of this recommendation. The Lake Lemon Conservancy District has taken a leadership role in the watershed to implement recommended restoration projects identified in the 1986 comprehensive diagnostic and feasibility study.

6.3 BEST MANAGEMENT PRACTICE SOLUTIONS

The primary mechanisms to control non-point source pollution are called best management practices (BMPs). BMPs are a means of preventing or reducing the availability, release or transport of substances that degrade surface or ground water. A single management practice or combination of practices situated in a specific location to mitigate a specified problem is considered "best" in the context of controlling non-point sources of pollution (Barton, 1999).

A matrix of BMPs and their relative effectiveness was developed for this report to identify specific solutions that can be used to mitigate non-point source pollution

(Table 10). Best management practices reviewed are limited to those BMPs that are eligible for technical and cost share assistance from the US Department of Agriculture, Natural Resources Conservation Service (USDA-NRCS).

Results of the matrix analysis reveal the following BMPs most suitable for meeting Lake Lemon water quality goals.

- > Nutrient management (590)⁵;
- > Streambank and shoreline stabilization (580); and
- Waste management systems (312).

Specific BMP solutions are evaluated below for potential implementation in the Lake Lemon watershed (Table 11).

6.4 RESERVOIR SEDIMENTATION MANAGEMENT

Managing excessive sedimentation in the east end of Lake Lemon requires a multiphased implementation approach. Elements of the phased approach include restoration, stabilization, and prevention. Measuring the effectiveness of the various sedimentation mitigation measures includes documenting and managing information about the implementation of individual BMP measures and the continuation of annual water quality analyses conducted by the School of Public and Environmental Affairs (SPEA) of the University of Indiana.

6.4.1 Reservoir Sedimentation Restoration Project

A Lake Lemon Sedimentation and Restoration preliminary reservoir dredging design study recommended the creation of either elevated islands filled with adjacent dredged material or removing the dredged sediment material to one of three locations

⁵ USDA-Natural Resources Conservation Service (NRCS) National conservation practice code.

near the reservoir. Creating elevated islands is the most cost effective plan and would be constructed using a fiberglass piling containment system similar to the riprap erosion control methods currently being used around the lake. The recommended estimated reservoir sedimentation/restoration project costs is approximately \$2.2 million (Schneider, 2001). The reservoir sedimentation restoration preliminary construction design study and public presentation slides are provided in this report (Appendix H and I).

The sedimentation restoration project is considered a short-term control measure that must be augmented with a comprehensive watershed management program. The adoption and implementation of recommendations in the watershed management plan may require 10 to 20 years of landowner participation to significantly implement best management practices to effectively reduce the total sediment load from entering Lake Lemon (Zogorski et al., 1986).

Sediment removal in the east end of Lake Lemon may enhance the recreational capacity and thereby increase the recreational use and value of the reservoir. As a result, residents and homeowners may desire to invest in their individual properties which would enhance the long-term economic viability of the community. For example, a complementary benefit of this approach is that individual landowners may invest in a community sewer service (Zogorski et al., 1986).

6.4.2 Shoreline Stabilization

A total of 3,779 linear shoreline feet of CBU property were stabilized with funding provided by IDNR's Lake and River Enhancement Program (LARE). Additional shoreline stabilization is necessary for private property surrounding the reservoir. Prioritized as issue number nine, watershed citizens requested that the appropriate authorities seek government funding for private landowners to stabilize the reservoir's remaining shoreline. The total number of shoreline linear feet in need of

stabilization on private property and potential project costs for is not known at this time.

Specific stabilization techniques are dependent on site-specific considerations and should be developed by appropriate authorities. Details of potential shoreline erosion control measures are provided in several previous Lake Lemon research studies (Zogorski et al., 1986; and Jones, 1992).

Examples of shoreline protection measures include:

- > Vegetation;
- ➤ Bank Sloping;
- > Beach sloping;
- > Riprap;
- > Gabions;
- > Concrete;
- > Piling; and
- > Groins (Zogorski et al., 1986).

6.4.3 Streambank Stabilization

Streambank erosion is caused by the natural flow, cutting action and dispersion of energy contained in stream water. Streambank stabilization controls consist of structural and non-structural techniques that slow water runoff and streamflow velocities. Stream meanders and in-stream obstructions help reduce streamflow velocity and reduce channel erosion.

Examples of structural controls include:

- > Deflectors;
- > Artificial obstructions;

- > Riprap; and
- Gabions.

Examples of non-structural streambank erosion control measures include:

- > Vegetative buffers;
- > Banksloping to reduce steep streambanks; and
- > Remove localized turbulence causing erosion (Zogorski et al., 1986).

A comprehensive stream channel study to survey the morphological features of Beanblossom, Plum and Possum Trot Creeks is needed. The purpose of the streambank survey is to identify and quantify critical areas of the stream corridor in need of stabilization, estimate project costs and develop an implementation timeline. Results of the comprehensive streambank channel assessment will provide the benchmark for evaluating and measuring progress of streambank stabilization implementation.

6.4.4 Sediment Detention Basins

Sediment detention basins can slow the velocity of flowing water and provide a large catchment area for sediment to settle prior to release or discharge into a receiving stream. An estimated 225 acres of wet detention basins were recommended to remove 70 – 90% of suspended sediments from streams of the Lake Lemon watershed (Zogorski et al., 1986). However, sediment detention basins are considered an expensive solution and should be implemented with other runoff control measures such as localized BMPs and streambank stabilization techniques (Barton, 1999).

Prior to installing sediment detention basins, a watershed-wide sediment detention basin assessment is necessary. The purpose of the comprehensive assessment is to:

> Identify optimal locations for the sediment basins;

- Estimate project design and implementation costs; and
- > Develop an implementation timeline.

Results of the watershed-wide sediment detention basin assessment will provide the benchmark for evaluating and measuring progress of sediment detention basin implementation.

6.4.5 Land Use Management

A detailed site-specific evaluation of potential BMPs for the Lake Lemon Watershed is beyond the scope of this document. The Monroe and Brown County SWCDs and corresponding NRCS are the most qualified local conservationists who can provide suitable site specific customized recommendations, and in some cases conservation cost-share funding, to individual private landowners.

As part of the site-specific solutions, a strategic and comprehensive conservation implementation plan is a critical need by both the Brown County conservationists to achieve the desired soil erosion reduction goals from land use practices. A part of this plan should inventory existing conservation program participation by landowners, type of conservation cost share projects implemented, geo-spatial distribution of conservation cost-share projects, identification of critical areas in need of soil erosion control practices. Results of the watershed-wide conservation management need assessment will provide the benchmark for evaluating and measuring progress of land use management changes.

6.5 AQUATIC VEGETATION MANAGEMENT

A comprehensive aquatic vegetative management plan has been developed and currently managed by the LLCD. Techniques to control the excessive growth of aquatic vegetation include chemical, manual, and water elevation controls. Costs for

these control measures range from minimal for reservoir elevation management to high for chemical controls estimated at \$30,000 annually. Adjusting reservoir elevation for aquatic vegetation control may cause unwanted shoreline erosion and manual harvesting is difficult and time-consuming work. Chemical treatment of aquatic vegetation is most effective and costs about \$325 per reservoir acre per year. The Aquatic Management Plan provides details of the use of all vegetative control types and is recommended for further information and details on the control and management of aquatic vegetation (Hoffmann, 2000).

Measuring the effectiveness of chemical treatment applications can be ascertained through the continuation of the annual water quality analyses conducted by Indiana University's School of Public and Environmental Affairs (SPEA).

6.6 FAILING SEPTIC SYSTEMS

Issue addressed in section 6.8, Bacterial Contamination.

6.7 STREAMBANK EROSION

Issue addressed in section 6.4, Reservoir Sedimentation Management.

6.8 BACTERIAL CONTAMINATION

Failing and inadequate on-site septic systems cause bacterial contamination to Lake Lemon. This occurs primarily in the reservoir's east end near the Chitwood Addition and along the lower reaches of Beanblossom Creek (Zogorski et al., 1986). The soils of the watershed, small lot sizes, and a high water table make the area unsuitable for traditional methods of treating human waste. The ideal solution to this problem is the

installation of a sewer system to transport and effectively treat human waste. This solution is extremely costly and would best be undertaken by the Brown County Health Department.

Measuring the effectiveness of bacterial contamination controls can be ascertained through the continuation of annual water quality analyses conducted by the SPEA.

6.9 FLOODING

Identifying and recommending specific measures to prevent flooding near Trevlac along the banks of Beanblossom Creek is beyond the scope of this report. A flood mitigation study and plan is necessary to obtain the engineering information to optimize public health and safety for the lower Beanblossom communities.

7.1 OVERVIEW

Restoring and protecting water resources of the Lake Lemon watershed requires collaboration, planning, public education and participation, restoration project demonstration, and the implementation of restoration measures. The LLCD will lead restoration activities such as the reservoir's sedimentation/restoration project and shoreline stabilization. Restoration projects, outside LLCD's jurisdiction, such as streambank stabilization and land use management, will require the collaboration of public agency resources and the participation of private landowners.

The Brown County SWCD, NRCS and Hoosier Heartland RC&D should, as part of their established missions, lead restoration initiatives outside of the LLCD jurisdiction. More challenging issues such as flooding and bacterial contamination caused by failing septic systems will require the LLCD to work with the Monroe County Engineering Department and Brown County Department of Health.

A result of this multi-agency collaboration between LLCD and appropriate agencies will enable landowners and public agency stakeholders to become eligible for state and federal restoration funding. An important note to consider is that in all cases representatives of the granting agency should be contacted before the grant application is developed and submitted. A brief list of available conservation funding programs is provided in Table 13.

A proposed general action timeline with lead project agency is provided (Table 12). Recommended priority issues for immediate action include:

- Convene watershed steering committee;
- > Obtain permits for the Lake Lemon east end sedimentation/restoration project;

- > Apply for Section 319 grant funding for a streambank stabilization and demonstration project; and
- Apply for FEMA Hazard Mitigation Grant Program.

7.2 STEERING COMMITTEE

The Lake Lemon Conservancy District will lead the development of a watershed steering committee. This committee will be responsible to focus the conclusions of the LLWPC an assist in project develop for the implementation of the plan of action recommended in this plan.

The following identifies recommended participants of the watershed steering committee.

- ➤ Alvin Balmer, Brown County NRCS District Conservationist;
- Jerod Chew, Resource Conservationist, IDNR;
- ➤ Bill Cobb, Chairman, Lake Lemon Conservancy District;
- > James Farr, Agricultural Conservation Specialist, IDNR;
- Becky Fletcher, Hoosier Heartland RC&D;
- > Steve Glasgow, Water Quality Project Coordinator, CBU; and
- Bob Madden, Manager, LLCD.

7.3 CONSERVATION PRACTICE FUNDING RESOURCES

A summary of fifteen potential funding resources for future planning and implementation of appropriate conservation measures identifies fifteen separate funding programs from state and federal agencies (Table 13). Details and additional information about specific project requirements and application deadlines should be

obtained from the appropriate funding agency. Additional details and contact information for each conservation implementation program is provided in this report (Appendix F).

7.4 SEDIMENTATION MANAGEMENT

Controlling sediment accumulation in Lake Lemon will require the use of in-lake restoration, shoreline and streambank stabilization and land use management measures. This section outlines specific actions to help control erosion at its sources and thereby reduce sedimentation rates in Lake Lemon.

7.4.1 Lake Lemon Sedimentation/Restoration Project

The Lake Lemon Sedimentation/Restoration Project proposed the development of elevated islands using a fiberglass piling containment system similar to that currently being used around the reservoir. This project should be initiated as soon as possible. To restore the reservoir's east end, the study recommends the LLCD complete the following tasks:

- > Obtain necessary permits from State and Federal agencies;
- > Finalize construction documents;
- > Obtain funding for the project; and
- > Implementation of the project, either in a single year or multi-year program (Schneider, 2001).

7.4.2 Lake Lemon Shoreline Stabilization

More than 2,892 linear feet of critical shoreline susceptible to erosion have been stabilized. The Indiana Department of Natural Resources (IDNR) Lake and River Enhancement Program (LARE) provided more than \$300,000 cost-share funding for this project. Additional shoreline stabilization is needed along private property. The LLCD should continue education and awareness for shoreline stabilization for private

property landowners. Shoreline stabilization is not as immediate as other restoration projects and is recommended for initiation in year two (Table 12). Based on recommendations by the watershed public, the LLCD and the Hoosier Heartland RC&D should pursue private landowner cost-share funding for shoreline stabilization from the IDNR LARE program.

7.4.3 Streambank Stabilization

Since the majority of the Lake Lemon watershed is outside LLCD jurisdiction, a collaborative and incremental streambank restoration and stabilization approach is recommended. Streambank stabilization is recommended for immediate action.

The incremental approach consists of three main phases and include:

- 1) Streambank stabilization demonstration project;
- 2) Comprehensive streambank stabilization needs assessment; and
- 3) Streambank stabilization implementation.

7.4.3.1 Streambank Stabilization Demonstration Project

A streambank stabilization demonstration project to restore a severely eroded streambank along Beanblossom Creek is strongly recommended. The severely eroded streambank site is located along State Route 45 between Trevlac and Helmsburg. The demonstration will provide public education and awareness concerning the need and benefits of restoring stream corridors while stabilizing and restoring a critical site where significant erosion has caused road damage. As members of the watershed steering committee, LLCD, Brown County SWCD and Hoosier Heartland RC&D should collaborate to pursue the development of this demonstration project.

7.4.3.2 Recommended Streambank Stabilization Demonstration Project Funding Resources

Funding for streambank restoration, stabilization and public education should be obtained from the US EPA Non-Point Source Pollution Reduction Grant Program (Clean Water Act Section 319). The Indiana Department of Environmental Management (IDEM), Watershed Management Section administers the 319-grant program in Indiana. LLCD, Brown County SWCD and Hoosier Heartland RC&D should lead the 319 grant application development and submit during the next available grant request for proposals (Appendix F).

Applications for Section 319 Nonpoint Source Grants are typically available annually. The total amount of funding available is based on Congress' annual allocation to the State of Indiana. Two separate Section 319 solicitations are available for fiscal year 2002 and are:

- ➤ Special Targeted Incremental Solicitation deadline March 31, 2002; and
- Section 319 Grant Solicitation deadline October 1, 2002.

The Special Targeted Incremental Solicitation grant is recommended for the LLCD, Brown SWCD and Hoosier Heartland RC&D to apply for funding. This grant will be used for the Beanblossom Creek streambank stabilization demonstration project. Grant Application details can be obtained at the following Internet site, http://www.in.gov/idem/water/planbr/wsm/app_page.html.

7.4.3.3 Streambank Stabilization Assessment

The second phase recommended for streambank restoration is comprehensive watershed-wide streambank stabilization needs assessment. The needs assessment survey will characterize, identify, quantify specific streambank sites that are highly susceptible to erosion and severely eroded areas that require restoration. The Brown County SWCD and Hoosier Heartland RC&D should lead this watershed-wide streambank erosion study. This study should complement a flood study recommended in Section 7.5.

7.4.3.4 Streambank Stabilization Needs Assessment Funding Resources

THE CLEAN WATER ACT SECTION (CWA) 205(J) WATER QUALITY PLANNING GRANT PROGRAM

The Clean Water Act Section (CWA) 205(j) Water Quality Planning Grant Program provides funding for water quality management planning and design (Appendix F). The Indiana Department of Environmental Management (IDEM) administers the program. Funding from the CWA 205(j) can be used to assess the nature, extent and causes of non-point source pollution problems and develop plans that mitigate the identified problems (IDEM, 2001).

The Brown County SWCD and Hoosier Heartland RC&D should lead the Section 205(j) grant application development and submit during the next available grant request for proposals (Appendix F). Details of the 205(j) grant application can be obtained at the Internet site http://www.in.gov/idem/water/planbr/wsm/Section205j main.html.

INDIANA LAKE AND RIVER ENHANCEMENT PROGRAM

Another source of funding for the watershed streambank stabilization diagnostic study is available from the Indiana Lake and River Enhancement (LARE) program. The Indiana Department of Natural Resources, Division of Soil Conservation manages this conservation planning and implementation grant program. General goals of this

program are to establish a basis for LARE grant applications and identify specific directions for future watershed implementation projects (IDNR, 2001).

Details of IDNR's LARE program and grant application can be obtained from IDNR's Internet site http://www.state.in.us/dnr/soilcons/lare.htm.

7.4.3.5 Implement Streambank Stabilization Measures

The third phase of the streambank stabilization program is the implementation of site-specific stabilization measures as identified in the streambank stabilization needs assessment. The Brown County SWCD and NRCS, and Hoosier Heartland RC&D are the appropriate lead agencies to provide technical and financial assistance for the implementation and management of streambank stabilization measures.

7.4.3.6 Streambank Stabilization Funding Resources

Funding for watershed-wide implementation of streambank stabilization structures, sedimentation basins, and other potential measure to reduce erosion can be obtained from a variety of local, state and federal resources. Usually, this funding is available for site-specific restoration and can be used as a cost-share with individual landowners.

The Brown County SWCD and NRCS, and Hoosier Heartland RC&D should lead the investigation to identify and secure appropriate federal streambank stabilization funding (Appendix F).

7.5 AQUATIC VEGETATION MANAGEMENT

Continue the chemical treatment recommendations that control over abundant nuisance aquatic vegetation based on recommendations of the Lake Lemon Aquatic Plant Management Plan (Hoffmann, 2000). LLCD budgets approximately \$30,000 annually for chemical treatment to control the aquatic vegetation.

7.6 BACTERIAL CONTAMINATION MANAGEMENT

7.6.1 On-Site Septic System Management

Bacterial contamination of Lake Lemon is caused by failing and inadequate onsite septic systems surrounding the reservoir. The ideal solution is the installation of a community-wide sewer system to transport and treat waste. Unlike sedimentation, bacterial contamination in Lake Lemon is not severe enough to preclude recreational use of the reservoir. Therefore, it is recommended that this issue follow actions to secure funding for streambank and shoreline stabilization.

7.6.2 Bacterial Contamination Management Funding Resources

The following is a list of potentially available funding resources the watershed steering committee should investigate to help reduce bacterial contamination of Lake Lemon. The LLCD should collaborate with the Brown County Health Department to identify and secure funding for on-site septic system maintenance.

Potential Funding Resources:

- US Department of Agriculture
 - Water and Waste Disposal Systems for Rural Communities
 - Public Works and Development Facilities Program
- US Environmental Protection Agency

- Water Quality Cooperative Agreements
- Sustainable Development Challenge Grants

7.7 FLOOD MANAGEMENT

Recommending specific control measures to prevent further flooding near Trevlac along the banks of Beanblossom Creek is beyond the scope of this report. The LLWPC recognizes that a flood mitigation study is warranted to provide the necessary engineering information to address flooding.

7.7.1 Flood Management Assessment

Because of the concern for public safety and as the leading cause of erosion in the watershed, the Lake Lemon watershed steering committee should immediately seek and secure funding for a watershed flood study (Table 12). Two potential funding resources available are potentially available by the Federal Emergency Management Agency (FEMA) for the communities in the Lake Lemon watershed (Appendix G).

Potential flood protection resources identified include:

- > Hazard Mitigation Grant Program; and
- > Flood Mitigation Assistance.

7.7.2 Flood Management Funding Resources

The Hazard Mitigation Grant Program assists States and local communities implement long-term hazard mitigation measures following a major disaster declaration. The program's objectives are:

"to prevent loss of lives and property due to disasters, implement hazard mitigation plans, enable mitigation measures during immediate recovery form a disaster, and provide funding as necessary" (FEMA 1996).

The Flood Mitigation Assistance program provides funding for communities to develop flood mitigation plan and implement measures to reduce flood losses. Examples of projects eligible for funding include:

"elevation of insured structures, acquisition of insured structures and property, relocation and demolition, dry flood proofing, minor structural projects, and beach nourishment such as planting dune grass" (FEMA, 1997).

It is recommended that the Lake Lemon Conservancy District continue to work with local, state and federal officials to devise and implement a flood management program for the Lake Lemon watershed.

7.8 MEASURING SUCCESS

The LLCD has contracted with the Indiana University's School of Public Policy and Environmental Affairs (SPEA) to study water quality conditions of Lake Lemon annually since 1996. During the studies water quality samples were collected two-times each year in several regions of the lake. Results of these studies were used by the Lake Lemon Watershed Planning Committee to make critical recommendations for water quality protection programs. It is recommended that LLCD maintain funding for the water quality-monitoring program. The resultant water quality data will help ascertain the long-term value and effectiveness of implemented watershed wide conservation programs.

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TABLES

TABLE 1 LAND AREA DISTRIBUTION BY COUNTY AND SUB-WATERSHED¹⁾ Lake Lemon Watershed Management Plan

	14-Digit	Watershed Area ³⁾								
Sub-Watershed	Watershed HUC	Johnson		Brown		Monroe		Total		
	Number ²⁾	mi²	Percent	mi ²	Percent	mi ²	Percent	mi ²	Percent	
Beanblossom Creek - Headwaters	010	0.0	0.0%	18.4	25.8%	0.0	0.0%	18.4	25.8%	
North Bear Fork	020	0,2	0.3%	12.8	18.0%	0.0	0.0%	13.0	18.4%	
Beanblossom Creek - Lick/Bear Creeks	030	0.0	0.0%	21.4	30.0%	0.0	0.0%	21.4	30.0%	
Beanblossom Creek - Lake Lemon	040	0.0	0.0%	9.9	13.9%	<u>8.4</u>	11.8%	18.4	25.8%	
TOTAL		0.2	0.3%	62.5	87.9%	8.4	11.8%	71.2	100.0%	

¹⁾ Source of geo-spatial data: Engle, B., Hahn, L., and Jackson, J. 2000. Indiana Natural Resources and Environmental GIS Data: Purdue University, West Lafayette, IN.

^{2) 14-}Digit Hydrologic Unit Code (HUC): Sub-watershed of the larger Lake Lemon watershed 11-Digit HUC 05120202-010

³⁾ Determining watershed areas were derived from existing geo-spatial data using Environmental Systems Research Institute's (ESRI) ArcView * Geographic Information Management System (GIS).

TABLE 2 LAND AREA DISTRIBUTION BY PERCENT SLOPE¹⁾ Lake Lemon Watershed Management Plan

Cult Watershad	Watershed Area by Percent Slope ²⁾									
Sub-Watershed	0-5%	5-10%	10-15%	15-20%	>20%	Total				
North Bear Fork	4.2	4.7	2.5	1.1	0.5	13.0				
Beanblossom Creek - Lick/Bear Creeks	4.9	6.1	4.7	2.8	2.9	21.4				
Beanblossom Creek - Headwaters	4.5	5.6	4.1	2.3	1.9	18.4				
Beanblossom Creek - Lake Lemon	5.4	4.7	3.8	2.3	2.2	<u>18.4</u>				
Total	19.0	21.1	15.1	8.5	7.5	71.2				

¹⁾ Source of geo-spatial data: Engle, B., Hahn, L., and Jackson, J. 2000. Indiana Natural Resources and Environmental GIS Data. Purdue University, West Lafayette, IN.

²⁾ Determining watershed percent slope areas were derived from existing geo-spatial data using Environmental Systems Research Institute's (ESRI) ArcView® Geographic Information Management System (GIS) and ArcView® Spatial Analyst v1.1.

TABLE 3 LAND AREA DISTRIBUTION BY MAJOR SOIL ASSOCIATIONS¹⁾ Lake Lemon Waters hed Management Plan

Sub-Watershed	Watershed Area ²⁾ (square miles)								
	Stendal	Berks	Hickory	Pekin	Water	Total			
North Bear Fork	0.0	0.6	11.7	0.7	0.0	13.0			
Beanblossom Creek - Lick/Bear Creeks	2.5	15.5	1.7	1.7	0.0	21.4			
Beanblossom Creek - Headwaters	0.0	6.9	10.2	1.3	0.0	18.4			
Beanblossom Creek - Lake Lemon	<u>1.8</u>	<u>12.3</u>	0.0	2.1	2.1	18.3			
Total (mi²)	4.3	35.3	23.6	5.8	2.1	71.1			

¹⁾ Source of geo-spatial data: Engle, B., Hahn, L., and Jackson, J. 2000. Indiana Natural Resources and Environmental GIS Data. Purdue University, West Lafayette, IN.

²⁾ Determining major soil associations by sub-watershed areas were derived from existing geo-spatial data using Environmental Systems Research Institute's (ESRI) ArcView® Geographic Information Management System (GIS).

TABLE 4 LAND AREA DISTRIBUTION BY LAND COVER TYPE¹⁾ Lake Lemon Watershed Management Plan

Sub-Watershed	Watershed Area2) (square miles)									
	Barren	Developed	Forest	Pasture/Hay	Row Crops	Water	Wetlands	Total		
North Bear Fork	0.0	0.0	7.8	3.1	1.7	0.2	0.0	13.0		
Beanblossom Creek - Lick/Bear Creeks	0.0	0.1	17.6	2.2	1.2	0.2	0.1	21.4		
Beanblossom Creek - Headwaters	0.0	0.1	12.5	3.9	1.6	0.2	0.0	18.4		
Beanblossom Creek - Lake Lemon	<u>0.0</u>	0.2	<u>13.0</u>	1.8	0.9	2.3	0.1	<u>18.4</u>		
Total (mi²)	0.1	0.4	51.0	11.1	5.4	3.0	0.2	71.1		

¹⁾ Source of geo-spatial data: Engle, B., Hahn, L., and Jackson, J. 2000. Indiana Natural Resources and Environmental GIS Data . Purdue University, West Lafayette, IN.

²⁾ Determining soft association areas were derived from existing geo-spatial data using Environmental Systems Research Institute's (ESRI) ArcView Geographic Information Management System (GIS).

TABLE 5 LAND OWNERSHIP BY SUB-WATERSHED^{1) and 2)} Lake Lemon Water*hed Management Plan

	Yello	wwood State Fo	orest ³⁾	Morga	n-Monroe State	Private Property		
Sub-Watershed	Acres	Percent of Watershed	Percent of Total State Forest Land	Acres	Percent of Watershed	Percent of Total State Forest Land	Acres	Percent of Watershed
Beanblossom Creek - Headwaters	47.6	0.4%	0.2%	0.0	0.0%	0.0%	11712.0	99.6%
North Bear Fork	201.2	2.4%	4.3%	0.0	0.0%	0.0%	8064.0	97.6%
Beanblossom Creek - Lick/Bear Creeks	2423.9	32.7%	55.4%	0.0	0.0%	0.0%	11264.0	44.6%
Beanblossom Creek - Lake Lemon	1092.1	9.3%	24.9%	<u>634.8</u>	5.3%	14.5%	<u>10048.0</u>	85.4%
Total	3764.8	8.3%	84.8%	634.8	1.4%	14.5%	41088.0	90.3%

¹⁾ Source of geo-spatial data: Engle, B., Hahn, L., and Jackson, J. 2000. Indiana Natural Resources and Environmental GIS Data . Purdue University, West Lafayette, IN.

²⁾ United States. Geological Survey. Beanblossom Quadrangle, Indiana; 7.5 Minute Series, Reston, VA, U.S. Geological Survey, 1980.

³⁾ Determining public property ownership areas were derived from digitizing state forest property from existing US Geological Survey topographic maps using Environmental Systems Research Institute's (ESRI) ArcView[®] Geographic Information Management System (GIS).

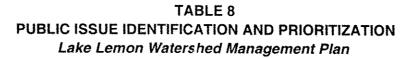
TABLE 6 WASTEWATER TREATMENT PLANT DISCHARGES INVENTORY^{1 and 2)} Lake Lemon Watershed Management Plan

Sewage Treatment Plant	County	NPDES ³⁾ Permit Number	Receiving Stream	Capacity, mgd
Camp Gallahue Council	Brown	IN0053899	Jack Creek	0.013
Lutheran Hills Camp Brown	Brown	IN0039110	Bear Creek	0.0076
Sprunica Elementary School	Brown	IN0049891	North Fork Salt Creek	0.006
Helmsburg Regional Sewer District	Brown	IN0058416	Tributary to Bear Creek	0.013

- 1) Jones, W.W. 1992. Lake Enhancement Study. School of Public and Envirionmetal Affairs, Indiana University. Bloomington, IN.
- 2) IDEM. 1998. Indiana Water Quality Report, 1998. IDEM/34/02/002/1998. Office of Water Management, Indiana Department of Environmental Management, Indianapolis, IN.
- 3) National Pollution Discharge and Elimation System

TABLE 7 WATERSHED PLANNING COMMITTEE REPRESENTATIVES Lake Lemon Waters hed Management Plan

Representative	Title	County	Agency/Organization
Jerod Chew	Resource Specialist	Brown	Indiana Department of Natural Resources
Shondra Chinn	Conservationist	Brown/ Monroe	IDNR Soils
Bill Cobb	Chairman, Board of Directors	Monroe	Lake Lemon Conservancy District
Al Donaldson		Brown	SWCD/Planning Commission
James Farr	Agricultural Conservation Specialist	Brown/ Monroe	IDNR - Division of Soil Conservation
Becky Fletcher		Brown/ Monroe	Hoosier Heartland RC&D
Steve Glasgow	Water Quality Project Coordinator	Monroe	City of Bloomington Utilities
Warren Henegar		Monroe	Monroe Co. Health Department
William Jones	Professor	Monroe	Indiana University, School of Public and Environmental Affairs
Kathy Kirk		Brown	Brown Co. SWCD
Steve Kale		Brown	Brown Co. Health Department
Bob Madden	Manager	Brown/Monroe	Lake Lemon Conservancy District
Chuck Ratts		Brown	DNR Division of Forestry
Don Sooby		Brown	Highway Department
Todd Stevenson	Drainage Engineer	Monroe	Monroe County Highway Department
Kenny Wagler	Farmer	Brown	Wagler Farms
Lloyd Wagler	Farmer	Brown	Wagler Farms
Ethel Wilkerson	Lake Biologist	Monroe/Brown	Lake Lemon Conservancy District



Issue #	Number of Votes	Total Votes	Rank	ISSUE DESCRIPTION
17	24	95	1	Sedimentation of the lake caused by shoreline and streambank erosion
24	14	43	2	Over Abundant Aquatic Macrophytes (plants)
19	13	41	3	Failing Septic System
20	15	41	4	Stream Bank Erosion
12	10	39	5	Alternative methods of treating aquatic plants
21	10	23	6	Bacterial contamination
18	7	22	7	Flooding in Trevlac and other areas near the lake
4	8	20	8	Drastic Erosion and Sedimentation on N. Shore Dr. and Ice Box Cove
1	6	18	9	Shoreline Erosion Funding for Private Individuals
7	5	11	10	Educate landowners in Watershed
5	4	10	11	Master Plan for Brown/Monroe Co. that addresses Water Quality Legislation
2	4	8	12	Personal Practices of Land users and Effect on Water Quality
6	4	7	13	Timing and Implementation of Plan Components
10	3	7	14	Work with landowners along Beanblossom Creek
16	2	7	15	Possum Trot Creek needs to be dredge so it doesn't fill Beanblossom Creek
8	1	5	16	Flooding on State Road 45
23	3	5	17	Agricultural Runoff
15	1	4	18	FEMA - Contact Leadership
11	2	2	19	Have LLCD work with DNR, SWCD, and NRCS on projects
22	1	1	20	Construction Runoff
3	0	0		
9	0	0		Work with INDOT
13	0	0		Maintenance of pond dam at SR 45 and Aqua Isle Rd.
14	0	0		Mosquito Problem

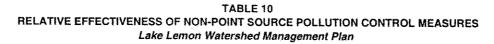




TABLE 9 PUBLIC PRIORITIZED CRITICAL ISSUES OF CONCERN Lake Lemon Watershed Management Plan

							SUPPORTING DOCL	IMENTED RESEAR	CH INVESTIGATION	IS	
ISSUE OF CONCERN	PRIORITY RANK	CRITICAL AREAS OF CONCERN	CAUSE	SOURCE	Phase I Diagnostic/ Feasibility Study, 1986 ²⁾	Lake Lemon Enhancement Study, 1992 ³⁾	Lake Lemon Conservancy District: District Plan, 1996 ⁴⁾	Biotechnical Shoreline Stabilization Project, 1997 ⁵⁾	Indiana Water Quality Report 305(b), 1998 ⁶⁾	Lake Lemon Aquatic Plant Management Plan, 2000 ⁷³	Lake Lemon Monitoring Program, 1997- Present ⁸⁾
Reservoir Sedimentation	1	East End of Reservoir near the Mouth of Beanblossom Creek	Steambank Erosion	Lower Beanblossom, Plum and Possum Trot Creeks	x	×				X	x
			Shoreline Erosion	Situated throughout the reservoir shoreline	×	×				*	X
			Land Use	Agricultural runoff from the North Fork Beanblossom Creek		x		x	***************************************		
Over Abundant Aquatic Vegetation	2	Primarity in shallow sediment laden areas in the east end of reservoir			x	x				×	x
Failing Septic Systems	3	Chitwood Addition and lower Beanblossom Creek	Improperly installed and/or failing on-site septic systems	Failing septic systems of Chitwood Addition and Lower Beanblossom Creek	x	×		***************************************	Andrew Street	11 N 1 O 1 O 1 O 1 O 1 O 1 O 1 O 1 O 1 O	THE REST OF THE COLUMN TWO COLUMN
Streambank Erosion	4	Lower Beanblossom, Plum and Possum Trot Creeks	Flooding	Lower Beanblossom, Plum, Ice Box and Possum Trot Creeks	x	x					
Bacterial Contamination	5	Shoreline near Chitwood Addition		Failing septic systems of Chitwood Addition and Lower Beanblossom Creek	×	x					x
Flooding	6	Treviac	Unknown	Unknown	x	x					

- HEFERENCES:
 1) Glander, 1982. Lake Lemon 1982 Fish Management Report. Division of Fish and Wildlife, Indiana Department of Natural Resources. Indianapolis, IN.
 2) Zogorski et al., 1986. Lake Lemon Diagnostic/Feasibility Study. School of Public and Environmental Attairs, Indiana University, Bioomington, IN.
 3) Jones and Clemenory, 1992. Lake Enhancement Study. School of Public and Environmental Attairs, Indiana University, Bioomington, IN.
 4) LLCD, 1996. District Plan. Lake Lemon Conservancy District, Unionville, IN.
 5) Commonwealth Biomonitoring, 1997. Lake Lemon Enhancement Study. Biotechnical Shorekine Stabilization Project. Commonwealth Biomonitoring, Bioomington, IN.
 6) IDEM 1998. Indiana Water Quality Report, 1998. IOEM/34/02/002/1998. Office of Water Management, Indiana Department of Environmental Management.
 7) Hoffman, 2000. Aquatic Management Plan, 2000. Lake Lemon Conservancy District, Unionville, IN.
 8) Jones et al., 1999. Lake Lemon Monitoring Program, 1999. Results. School of Public and Environmental Attairs, Indiana University, Bioomington, IN.
 8) Jones et al., 1999. Lake Lemon Monitoring Program, 1999. Results. School of Public and Environmental Attairs, Indiana University, Bioomington, IN.



		Non-Point :	Source Pollution C	ontrol Effectivenes	s Ranking ^s		*************		
Best Management Practice (BMP)	USDA BMP <u>Code</u>	Sediment Control Grade	Pathogen Control Grade	Adsorbed Nutrient Control Grade	Soluble Nutrient Control Grade	Relative Combined Effectiveness Score	Results	Estimated Costs	Recommended BMP
Conservation Crop Rotation	328	В	NA	В	В	3,33	М	\$5.00 / Acre	<u> </u>
Constructed Wetlands	657	₿	В	В	С	4.75	Н	Expensive	
Contour Farming	330	C'	C)	С	D	3.75	М	\$5.00 / Acre	***************************************
Cover and Green Manure Crop	340	E	С	D	D	3.00	M		***************************************
Critical Planting Areas ⁴	342	A ²	NA	N	NA	6.00	Н	Up to \$1,000 / Acre	······
Diversion	362	D	С	D	E	3.00	М	\$2.00/ acre	
Fencing	382	С	F²	С	С	3.25	М	\$5.00/ acre	
Field Border	386	E	C2	С	D	3.25	М		
Grade Stabilization Structure	410	D	NA	C¹	F2	2.67	M		
Grassed Waterways	412	С	NA	С	D	3.67	М	\$3.00/ sq. ft.	
Integrated Pest Management	685	NA	NA	F2	₽ ²	1.00	L	Varies	
Irrigation Water Management (Sprinkler)	442	A ²	NA	C¹	F ²	3,67	M	**************************************	***************************************
Irrigation water Management (Surface/ Subsurface)	443	B ²	NA	F ²	F ²	2.33	M		
Irrigation Water Management (Trailwater Recovery)	447	A ²	NA	A ²	A ²	6.00	Н		
Irrigation Water Management (Trickle Irrigation)	449	В	NA	C ¹	C ¹	4.33	Н	\$1000/ acre	**************************************
No-Till Conservation Tillage	329	В	NA	В	É	4.00	М	\$25.00/ acre	****
Nutrient management ⁵	590	NA	C¹	Α	A	5.33	н	Varies	X
Pasture Management-Short Term Grazing System	512	D	E	C	D2	3.00	M	\$3000/ acre	<u> </u>
Planned Grazing System	556	B ²	NA	D2	A ²	3.67	M	······	***************************************
Regulating Water in Drainage Systems	554	NA	NA	F ²	A	3,50	M	······································	
Residue Management	344	E ₅	NA NA	NA	NA	1.00			
Sediment Basin	638	A	NA	В	F	4.00	M	Expensive	10110000.00000.000.0000.0000.0000.0000.0000.0000
Streambank and Shoreline Protection	580	Α	NA	C	E	4.00	M	Varies	x
Stripcropping	586	C	C¹	С	C	4.00	М	\$25,00/ acre	
Stripcropping, Contour	585	C	NA	C	D	3.67	М		
Subsurface Drain	606	F	F2	NA	N	1,00	L	Varies	Y/\$_^\IIABWIA.II_MIA.III.AAIAI
Terraces	600	Α	C¹	Α	В	5.25	Н	\$200/ acre	
Tree/ Shrub Establishment	612	₽2	F ²	C¹	C ¹	2.50	M		**************************************
Vegetative Filter Strips	393	C	NA	E	E	3.00	M	Inexpensive	***************************************
Waste Management System	312	Α	В	Α	Α	5,75	H		x
Windbreak/ Shelterbelt Establishment	380	c'	NA	C'	F ²	3.00	М		

NOTES:

Individual BMP Effectiveness Grades: A-B = Medium to High Effectiveness

C - D = Medium Effectiveness

E - F = Low to Medium Effectiveness

Combined BMP Control Effectiveness Ranking: Score >4: H - Relative High Effectiveness Score 2 - 4: M - Relative Medium Effectiveness Score <2: L - Relative Low Effectiveness

COMMENTS

- 1 Sources vary in evaluation techniques.
- 2 Only one source reported.
- 3 Source of information: Barton, 1999 (Ohio State University)
- 4 Only Effective on sediment control and limited to one study
- 5 Nutrient management can be achieved through education and awareness at relatively minimal programmatic costs,
- 6 Although only ranks as Medium combined effectiveness, BMP is very effective at reducing stream channel degradation.

N/A Not Applicable







TABLE 11 POTENTIAL SOLUTIONS COMPARISON Lake Lemon Watershed Management Plan

				SUPPORTING DOCUMENTED RESEARCH INVESTIGATIONS REFERENCES							
ISSUE OF CONCERN	PRIORITIZED RANK	POTENTIAL SOLUTIONS	ESTIMATED COSTS	Phase I Diagnostic/ Feasibility Study, 1986 ²⁾	Lake Lemon Enhancement Study, 1992 ³	Lake Lemon Conservancy District: District Plan, 1896 ⁴⁾	Biotechnical Shoreline Stabilization Project, 1997 ⁵⁾	indiana Water Quality Report 305(b), 1998 ⁶)	Lake Lemon Aquatic Plant Management Plan, 2000 ^{7]}	Lake Lemon Monitoring Program 1997-Present ⁸⁾	Lake Lemon Sedimentation/ Restoration Project, 2001
Reservoir Sedimentation	1	Dredging	\$2.2 to \$3.2 million ⁹	×	x				x	×	×
		Shoreline Stabilization	Unknows	×	x		x		x	×	
		Streambank Stabilization	Unknown		The second secon						
		Sediment Detention Basins	Unknown								
		Land Use Management Practices (BMPs)	Unknown								
Over Abundant Aquatic Vegetetion	Z	Mechanical Harvesting	\$5,800 / year ⁷	×	X				X	×	
		Chemical Control	\$325 / acre / year [?]						x		
		Biological Control	Relatively High ⁷	·					x		***************************************
		Water Level Drawdown	Minimal [?]						×		
Failing Septic Systems	3	Unknown	Unknown	X	x						
Streambank Excision	4	Streambank Stabilization	Unknown	x	×						
Bacterial Contamination	5	Repair Falling Septic Systems	Unknown	×	×					×	
Fkxxding	6	Unknown	Unknown	×	×					x	

- REFERENCES:

 1) Glander, 1982. Late Lemon 1982 Fish Management Report. Division of Fish and Wildlib, Indians Department of Natural Resources. Indianapoles, 1

 2) Zogorekin et al., 1986. Late Lemon Disgrosofto-Fassbillty Stud. School of Public and Environmental Affairs, Indians University, Biocomington, 1

 3) Jones and Clemency, 1992. Late Enhancement Study. School of Public and Environmental Affairs, Indians University, Biocomington, II

 4) LUCD, 1996. Detriet Filer. Labe Lemon Consensation Study. Biochechikal Schooling Stabilization Proje. Commonwealth Simonomistoring, Biocomington, II

 5) Commonwealth Biocomindring, 1997. Late Lemon Enhancement Study: Biochechikal Schooling Stabilization Proje. Commonwealth Simonomistoring, Biocomington, II

 5) Commonwealth Biocomindring, 1997. Late Lemon Consensation District. University, Biocheck Management Plant, 2001. Late Lemon Consensation, District. University, Biocheck Schooling, 1992. Late Lemon Management Plant, 2001. Late Lemon Consensation Project Summary, Indianapolis, IN.

 9) Schoelder Corporation, 2001. Late Lemon Sedimental Schooling Public Summary, Indianapolis, IN.

TABLE 12 PROPOSED WATERSHED IMPLEMENTATION PLAN TIMELINE Lake Lemon Watershed Management Plan

	The second secon]				7 .0				
ISSUE OF CONCERN	RECOMMENDATION	SPECIFIC ACTION	LEAD AGENCY(S)	TIMELINE				_			
				6 Months	6 Months	6 Months	6 Months	6 Months	6 Months	6 Months	6 Months
Reservoir Sedimentation	East end sedimentation/ restoration project	Obtain Permits	LLCD			*				The state of the s	
		Finalize Construction Documents									
		Obtain Project Funding									
		Conduct Restoration Project				I SERVE					
	Streambank Stabilization	Apply for Demonstration Project Funding	RC&D/ SWCD								
		Conduct Demonstration Project							X2222		
		Comprehensive Watershed Study									
		Implement Stabilization and Restoration Projects									
	Shoreline Stabilization	Obtain funding for private landowners	LLCD/ RC&D								
		Implement Shoreline Stabilization Projects									
Flooding	Flood Study	Apply and obtain funding for flood study	Monroe County Engineer's office				1			1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	**************************************
		Conduct flood study	Monroe County Engineer's office						1	 	
Over Abundant Aquatic Vegetation	Aquatic Vegetation Management	Implement Aquatic Management Plan	псо								
Bacterial Contamination/ Falling Septic Systems	Preliminary Sewer Design Study	Apply for Funding	LLCD and Brown County Health Department					i i			
	-	Conduct Preliminary Design Study	LLCD and Brown County Health Department						mano and managaran		
		Implement Recommendations	LLCD and Brown County Health Department							 - 	ente les mantes de la companya de l

TABLE 13: CONSERVATION PRACTICE FUNDING RESOURCES SUMMARY AND CONTACTS¹⁾ Lake Lemon Water*hed Management Plan

OBJECTIVE	ISSUE OF CONCERN	GRANT PROGRAM	ACRONYM	LEAD AGENCY	DIVISION/ SECTION	LOCAL CONTACT	PHONE NUMBER
Planning			1	~~~~~			
	Sedimentation	Stormwater and Sediment Control Program	·	IDNR	Division of Soil Conservation	27	
	Sedimentation	Lake & River Enhancement Program	LARE	IDNR	Division of Soil Conservation	Jim Farr	(317) 233-3870
		Section 205(j) Water Quality Planning Grants	205	IDEM	Watershed Management Section	Jim Farr	(317) 233-3872
	Failing Septic Systems	Section 104(b)(3) Water Quality Planning Gratns	104(b)(3)	IDME	Watershed Management Section	Bonny Elifritz Bonny Elifritz	(317) 234-0923
			1	7,07,000	Trace and Management Section	DOWNY CHINEZ	(317) 234-0924
V-1-1	Flooding	Hazard Mitigation Grant Program		FEMA	Monroe County Highway Department	Todd Stevenson	
A.V	Flooding	Flood Mitigation Assistance Program	FMA	FEMA	Monroe County Highway Department		(812) 349-2499
/	Flooding	Watershed Protection and Flood Protection Program	PL-566	USDA	Brown County NRCS	Todd Stevenson	(812) 349-2500
			1		Liowi County NACS	Alvin Balmer/ Becky Fletcher	(317) 736-6829
Implementation	Sedimentation	Clean Water Indiana Program	CWI	ica ira		**************************************	***************************************
	Sedimentation	Lake & River Enhancement Program	LARE	IDNR	Division of Soil Conservation	Jim Farr	(317) 233-3871
V (V V V V V V V V V V V V V V V V V V	Sedimentation	Forestry BMP Cost-Share Program	LAME	IDNR	Division of Soil Conservation	Jim Farr	(317) 233-3872
V. V	Sedimentation	Stormwater and Sediment Control Program	-	IDNR	Division of Forestry	Duane McCoy	(765) 342-4026
	Sedimentation	Section 319 Non-Point Source Grants		JONR	Division of Soil Conservation	Jim Farr	(317) 233-3870
	Sedimentation	Wetlands Reserve Program	319	IDEM	Watershed Management Section	Bonny Elifritz	(317) 234-0922
······	Sedimentation	Forestry Incentives Program	WRP	USDA	Brown County NRCS	Alvin Balmer/ Becky Fletcher	(317) 736-6830
	Sedimentation	Conservation Reserve Program	FIP		Brown County NRCS	Alvin Balmer/ Becky Fletcher	(317) 736-6828
· · · · · · · · · · · · · · · · · · ·	Sedimentation	Environmental Quality Incentives Program	CRP	USDA	Brown County NRCS	Alvin Balmer/ Becky Fletcher	(317) 736-6822
	Sedimentation	Soil and Water Conservation Assistance	EQIP	USDA	Brown County NRCS	Alvin Balmer/ Becky Fletcher	(317) 736-6823
	Sedimentation	Emergency Conservation Program	SWCA	USDA	Brown County NRCS	Alvin Balmer/ Becky Fletcher	(317) 736-6824
	OCCURRENCE NO.	Chergency Conservation Program	ECR	USDA	Brown County NRCS	Alvin Balmer/ Becky Fletcher	(317) 736-6825
	Flood Prevention	Water Protection and Flood Prevention (ACT PL-566)	PL-566	USDA	Brown County NRCS	Alvin Balmer/ Becky Fletcher	(317) 736-6825
	Water Qualify	Wildlife Habitat Incentives Program	WHIP	USDA	Brown County NRCS	Alvin Balmer/ Becky Fletcher	(317) 736-6825
Research	VIII.						(017)700-0020
	Water Quality Data	Water Quality Special Research Grants Program		USDA	Brown County NRCS	Alvin Balmer/ Becky Fletcher	(317) 736-6826
ducation							
	Public Outreach	Environmental Education Grants Program	 	USDA	Brown County NRCS	Mile Delle (O	
	Demonstration Project	Section 319 Non-Point Source Grants	319	IDEM	Watershed Management Section	Alvin Balmer/ Becky Fletcher Bonny Elifritz	(317) 736-6827
Sewerage	A				The tracking of the Country	COMPY CHILL	(317) 234-0922
	Bacterial Contamination	Missor and Waste Disposed Content to St.					***************************************
		Water and Waste Disposal Systems for Rural Communities Public Works and Development Facilities Program			Brown County NRCS	Alvin Balmer/ Becky Fletcher	(317) 736-6825
		Trubic works and Development Facilities Program		USDA		Alvin Balmer/ Becky Fletcher	(317) 736-6825

Notes

1) Details for each of these conservation practice funding programs is available in Appendix F and Appendix G.



Figure 2 The Lake Lemon Watershed

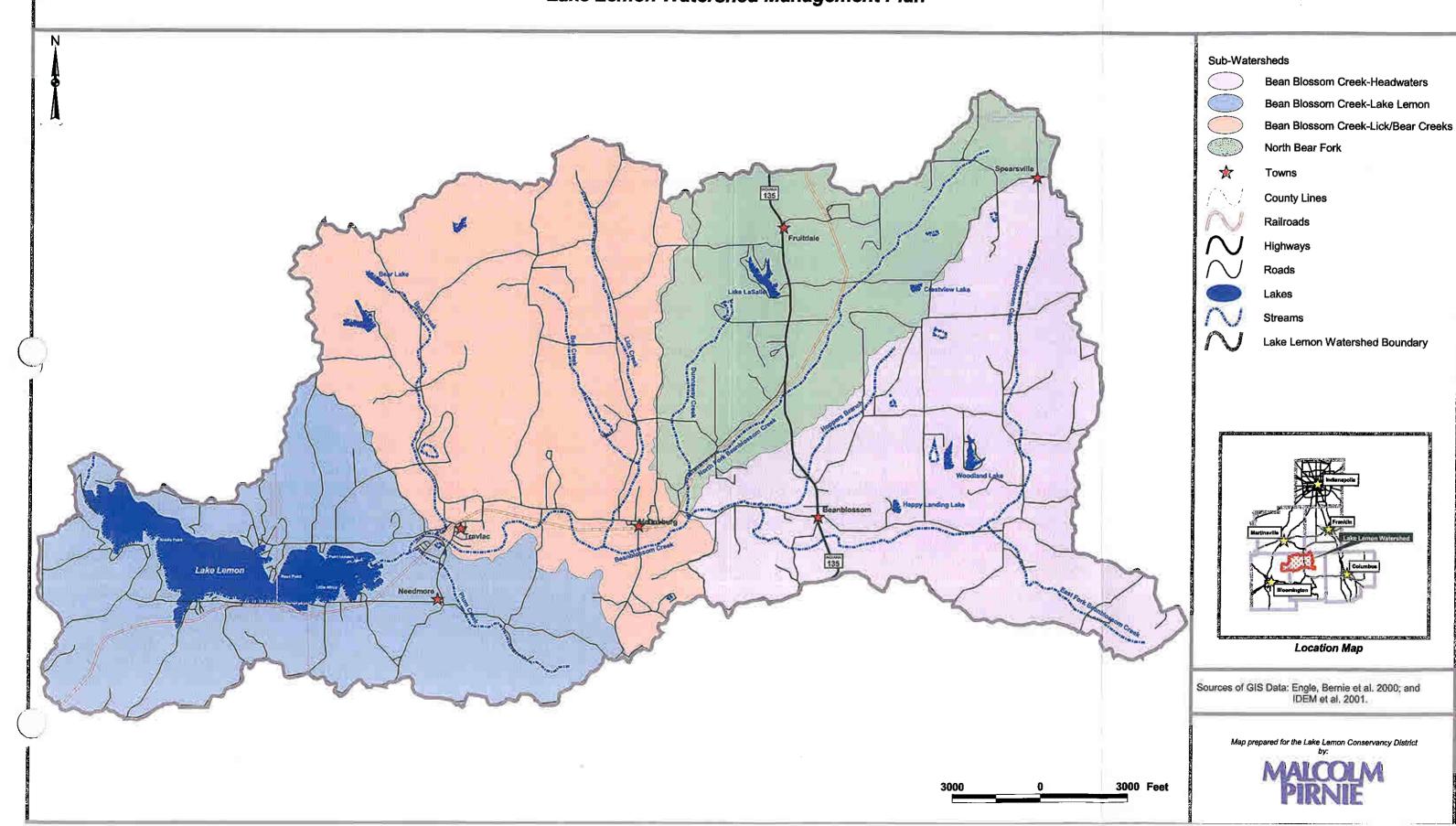


Figure 3 Topography of the Lake Lemon Watershed

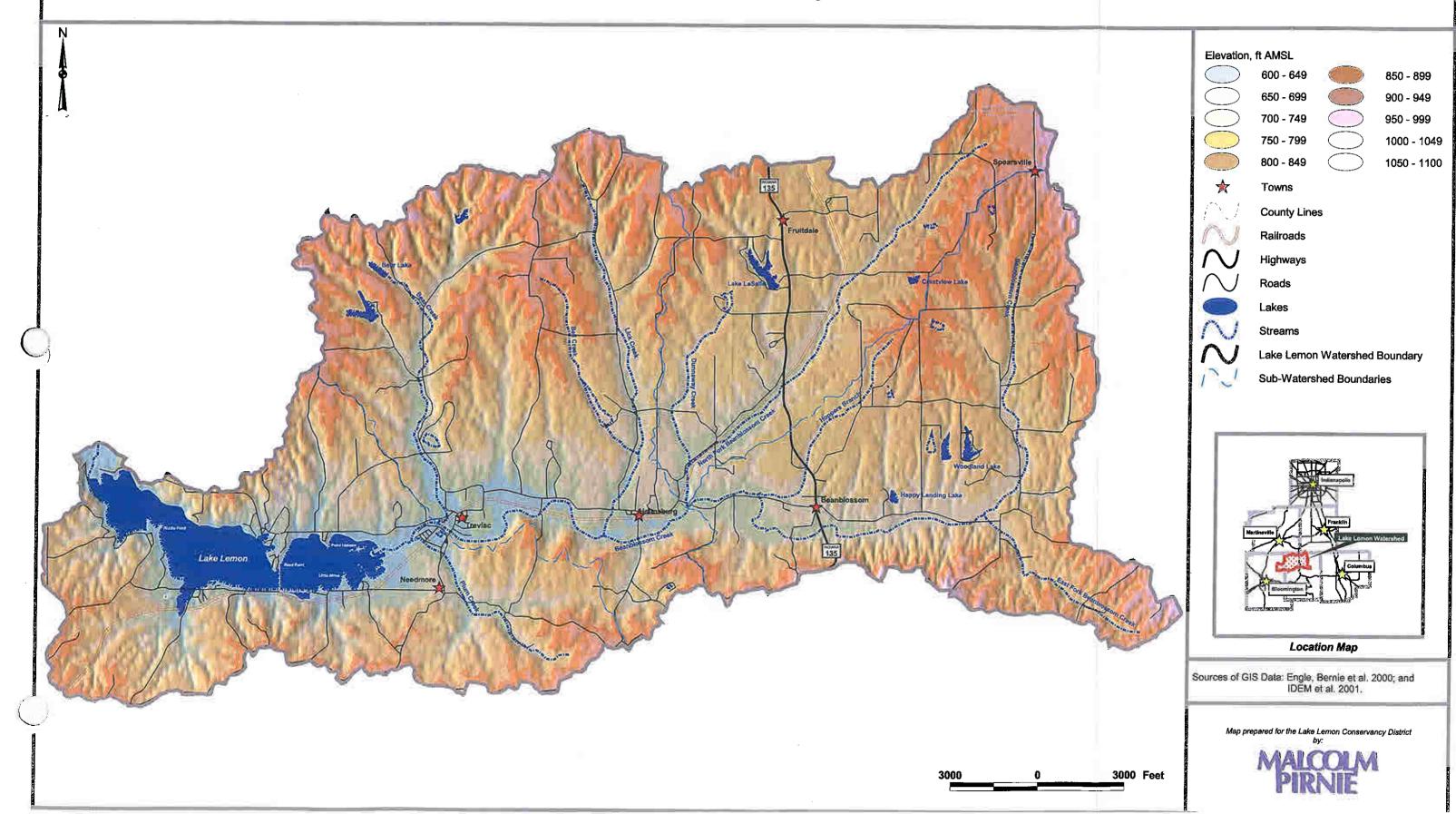


Figure 4 Slopes in the Lake Lemon Watershed

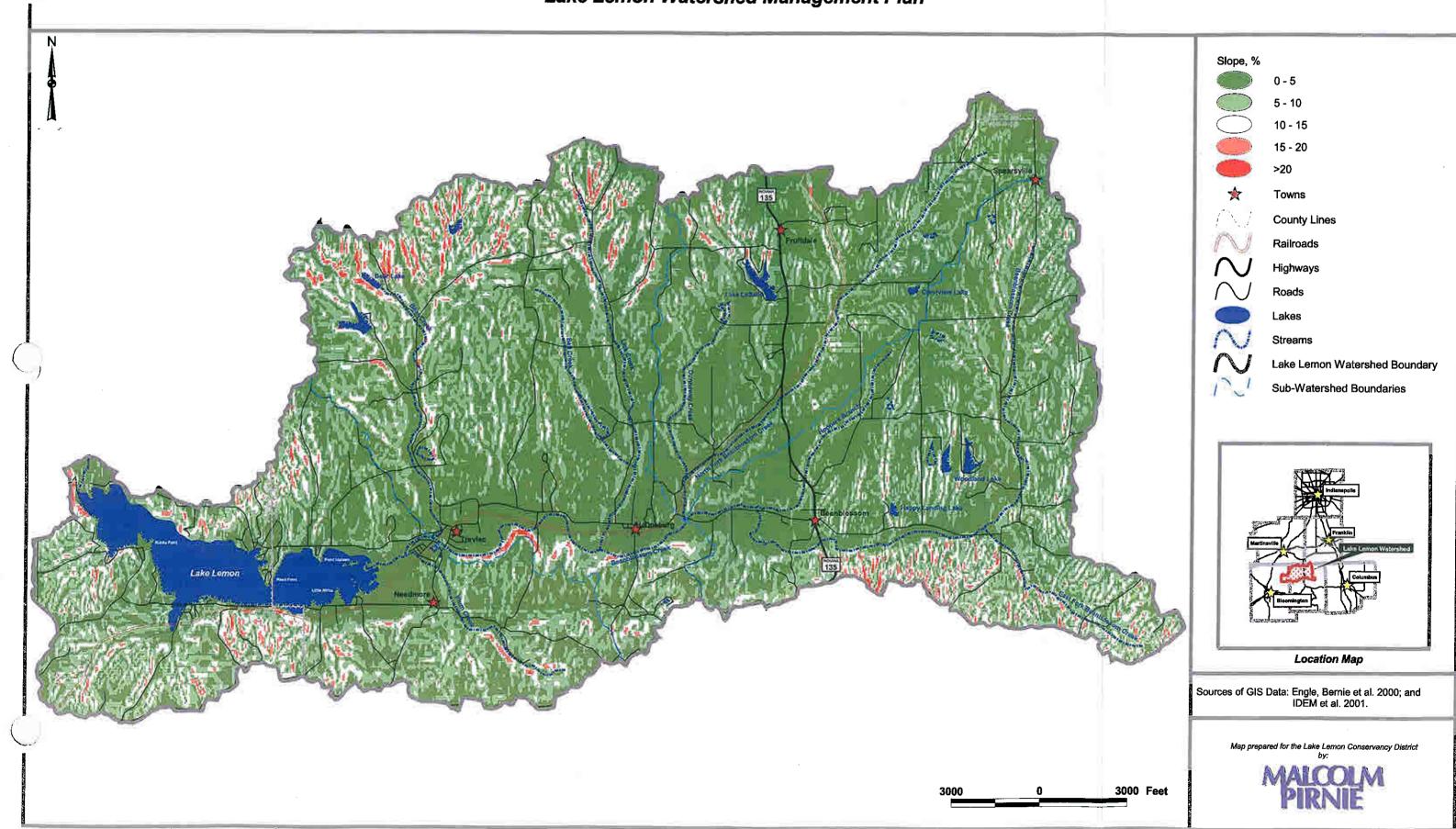


Figure 5 Major Soil Associations of the Lake Lemon Watershed

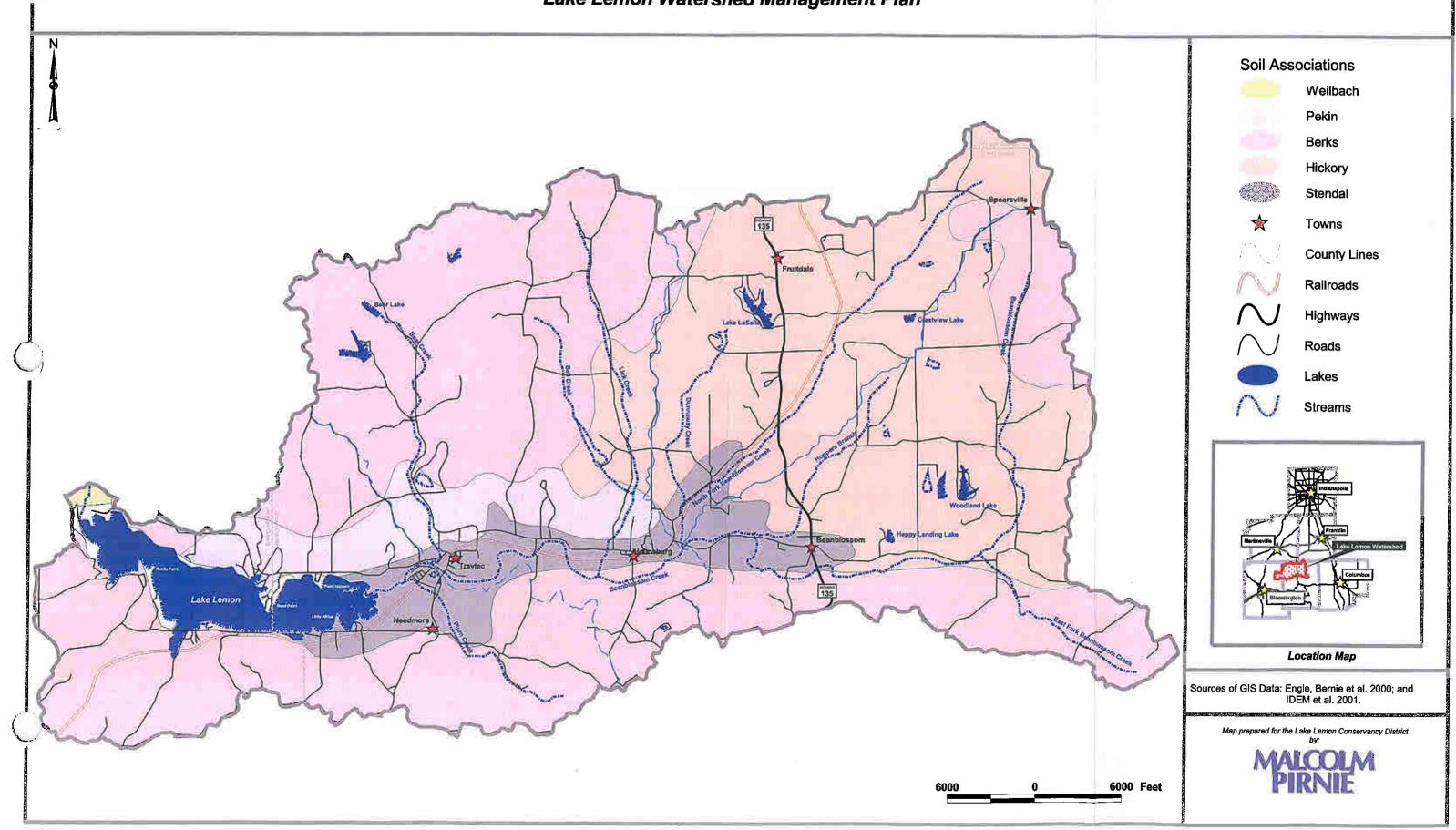


Figure 6 Land Cover Types in the Lake Lemon Watershed

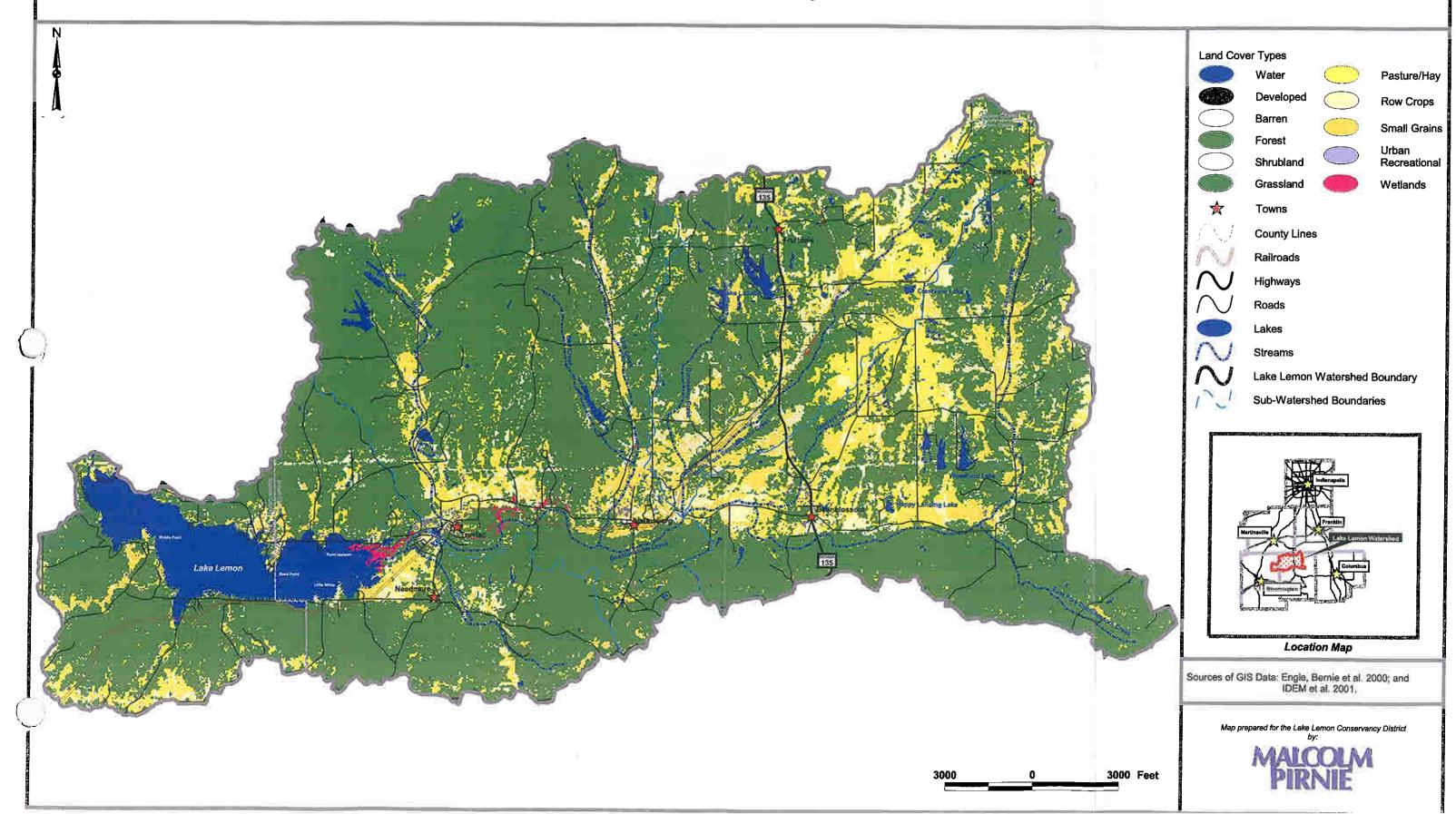


Figure 7 Public Land in the Lake Lemon Watershed

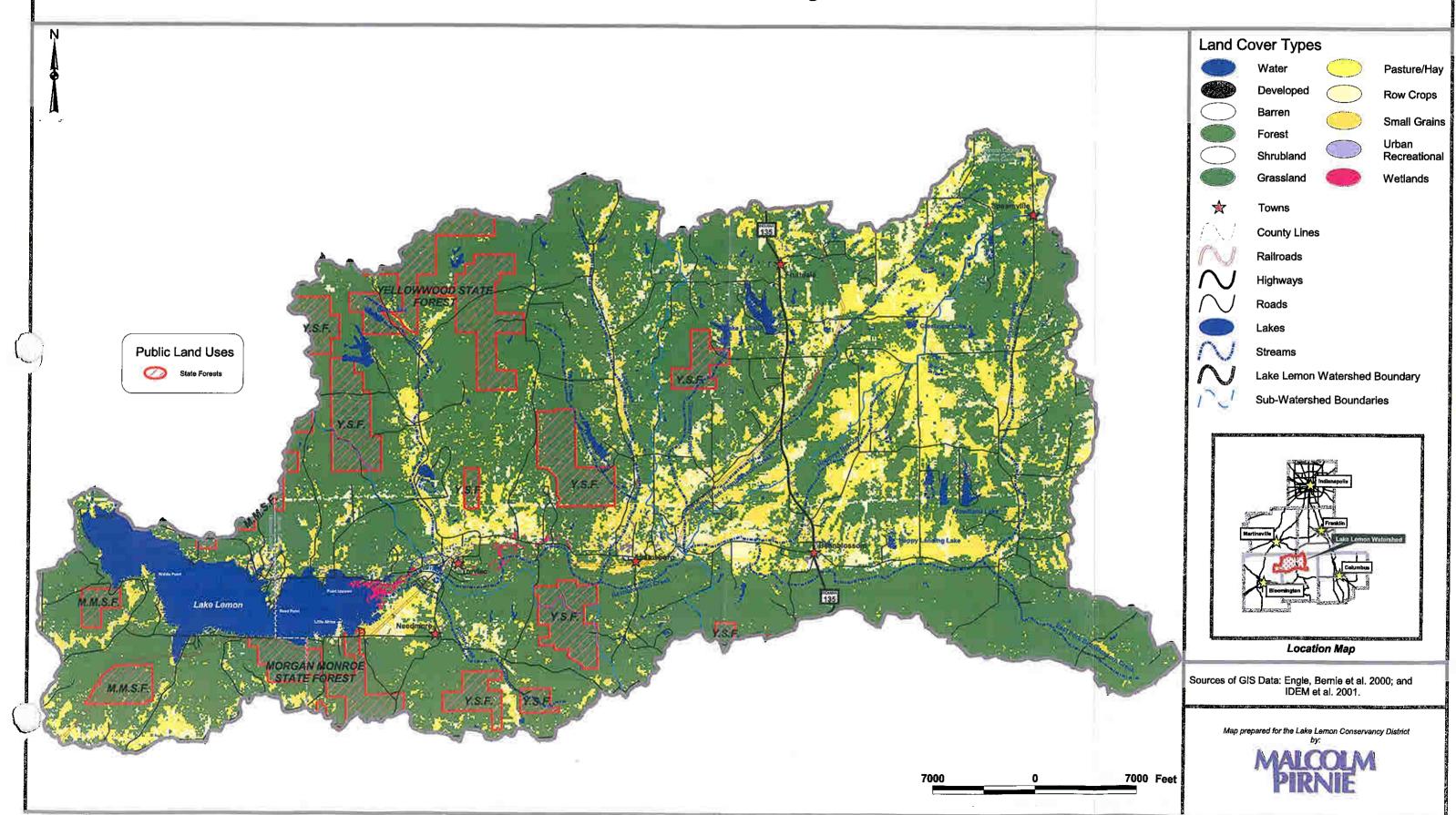
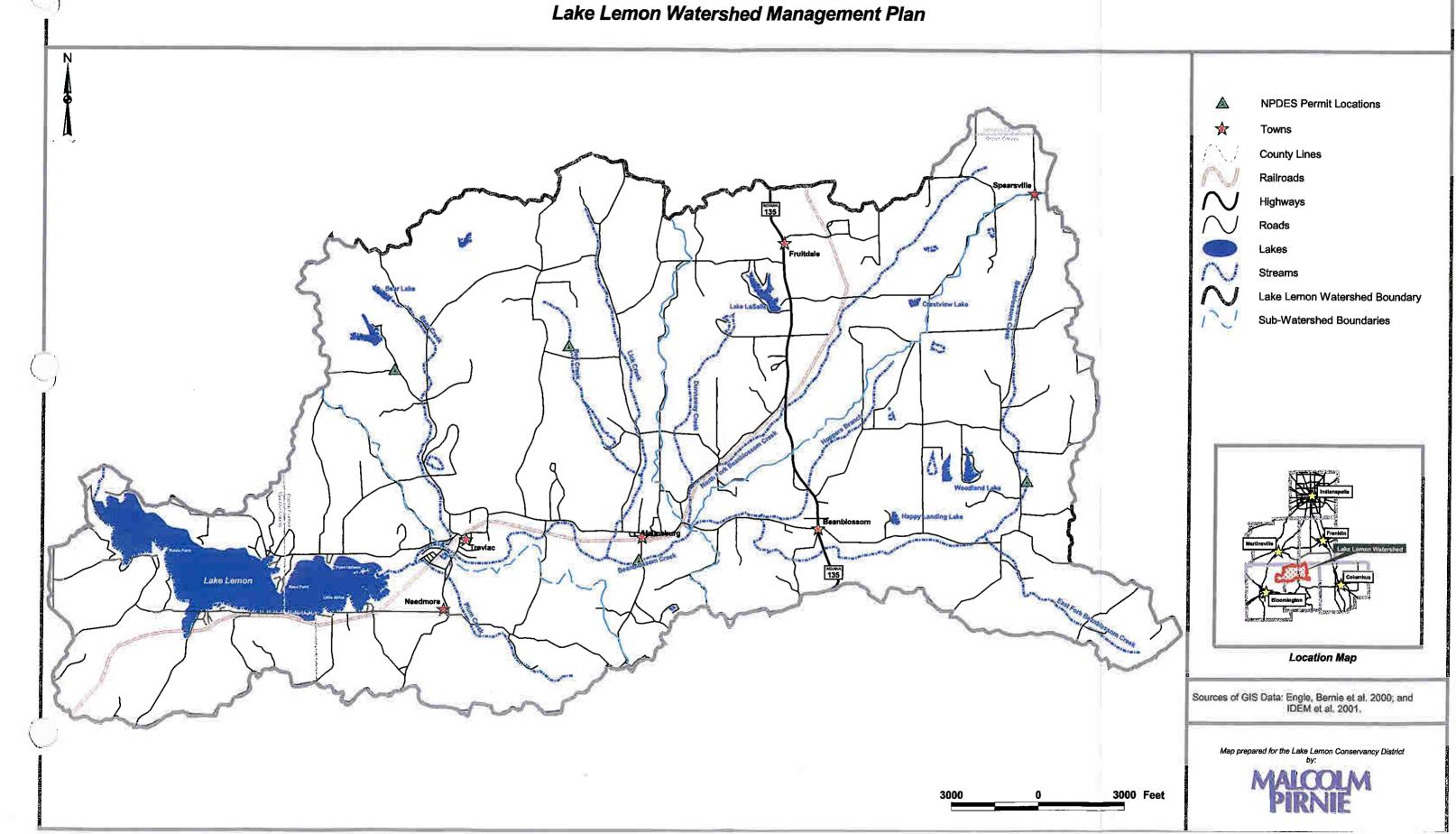


Figure 8 NPDES Permit Locations in the Lake Lemon Watershed



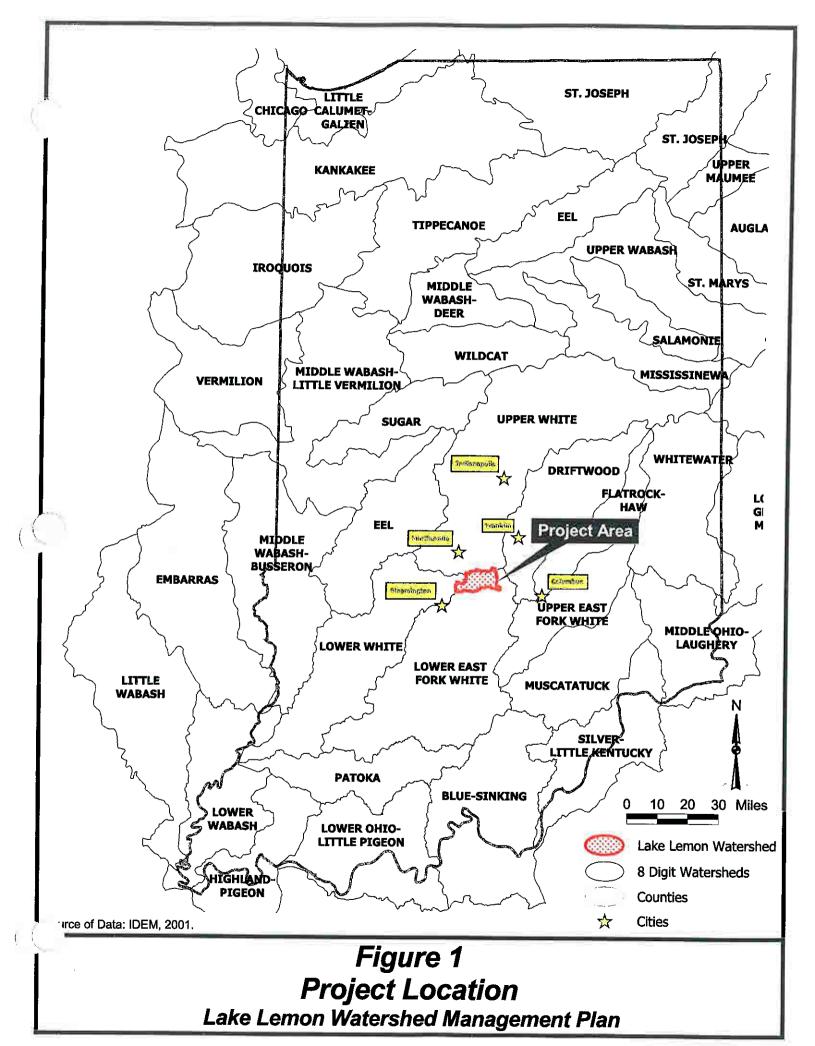






Photo 1: Northwestern aerial view of Lake Lemon. The sedimentation of the east end at the mouth of Beanblossom Creek is evident in this photo.



Photo 2: View of the east end of Lake Lemon. Overgrowth of vegetation and shallowness of the reservoir is evident by the lodged debris in the reservoir.

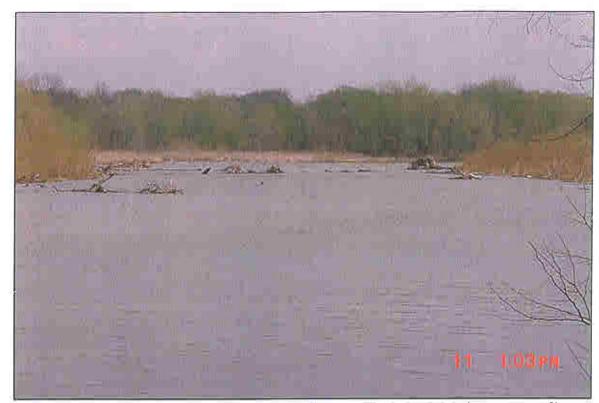


Photo 3: Easterly view of the east end of Lake Lemon. The lodged debris rests on sediment deposits and reduces boating navigation.

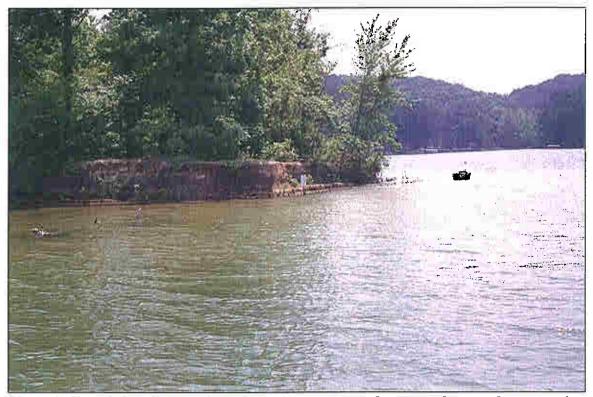


Photo 4: Site of shoreline erosion where signs are posted to warn boaters from entering area.



Photo 5: View of shoreline erosion near private property.



Photo 6: View of completed shoreline stabilization project of City of Bloomington property on the reservoir's North Shore.



Photo 7: View of shoreline stabilization project performed during a construction project. Note the poorly maintained silt fence.



Photo 8: View of shoreline stabilization performed by private landowners. No state or federal dollars were used.



Photo 9: View of shoreline stabilization by private landowner



Photo 10: View of tributary with clear water feeding into turbid lower Beanblossom Creek: April, 2001.



Photo 11: View of lower Beanblossom Creek where streambank erosion occurs near homeowner property in Trevlac.



Photo 12: View of streambank erosion where sloughing of unstable soils occurs.



Photo 13: View of severe streambank erosion of the lower Beanblossom Creek midway between Trevlac and Helmsburg.



Photo 14: View of lower Beanblossom Creek where muddy sediment laden water deposits silt and sand along the stream.



Photo 15: Site of road damage to State Route 45 in Brown County caused by severe streambank erosion along Beanblossom Creek.



Photo 16: View looking downstream of Beanblossom Creek where severe erosion caused damage to State Route 45. Note restoration attempts on the streambank and vehicle in upper right corner.



Photo 17: View of a submerged barn for livestock during a fall 2000 flood in Trevlac.



Photo 18: View of the fall 2000 flood in Trevlac.

APPENDIX B

LAKE LEMON WATERSHED MANAGEMENT PLAN KICKOFF MEETING APRIL 14, 2000 1:30 P.M.

LAKE LEMON CONSERVANCY DISTRICT OFFICE UNIONVILLE, INDIANA

Attendees:

Bob Madden, Lake Lemon Conservancy District

Ethel Wilkerson, Lake Lemon Conservancy District

Bill Cobb, Lake Lemon Conservancy District

Rick Shamblen, Malcolm Pirnie, Inc. Paul Amico, Malcolm Pirnie, Inc.

AGENDA

Review of Project Purpose and Goals

Project Team and Roles

Review of Project Scope and Schedule

Organizing the Planning Team

Conducting the Public Awareness Campaign

The Watershed Characterization

Discussion of Supporting Data and Data Sources

Identifying and Prioritizing the Issues of Concern

Identifying Potential Solutions and Costs

Building Consensus for the Solutions

Writing the Watershed Management Plan

LAKE LEMON WATERSHED MANAGEMENT PLAN KICKOFF MEETING MINUTES

The purpose of this document is to provide minutes from the kickoff meeting held for the Lake Lemon Watershed Management Plan. The meeting was held on Friday, April 14, 2000 at the Lake Lemon Conservancy District (LLCD) office. The agenda for the meeting is attached.

Attendees:

Bob Madden, Lake Lemon Conservancy District

Ethel Wilkerson, Lake Lemon Conservancy District

Bill Cobb, Lake Lemon Conservancy District

Rick Shamblen, Malcolm Pirnie, Inc. Paul Amico, Malcolm Pirnie, Inc.

1. Review of Project Purpose and Goals

A general discussion about the vision for the plan was held. While each of the team members from LLCD had specific subtle differences in their visions for the plan, the overall vision was consistent for each. Specifically the vision is for the watershed management plan to be a practical, working, planning document focused on addressing the problems in the lake related to it's physical (i.e. sedimentation loading), biological, and ecological characteristics. The plan should be specific enough so that partner agencies (like the Soil and Water Conservation Districts) can use it as the planning document to move into design and construction phases for the recommended improvements within the watershed.

2. Project Team and Roles

The following table outlines the project team and roles:

Member	Organization	Role			
Bob Madden	LLCD	LLCD project manager, meeting facilitator			
Ethel Wilkerson	LLCD	LLCD			
Bill Cobb	LLCD	LLCD Board and community liaison			
Tim Holdeman	Malcolm Pirnie	MPI project manager			
Rick Shamblen	Malcolm Pirnie	Project			
Paul Amico	Malcolm Pirnie	Project Engineer			
Dan Markowitz	Malcolm Pirnie	Quality Assurance Manager			

LAKE LEMON WATERSHED MANAGEMENT PLAN KICKOFF MEETING MINUTES

3. Review of Scope and Schedule

Lake Lemon Conservancy District Lake Lemon Watershed Management Plan Planning Committee Meeting #1 June 27, 2000

Discussion Item	Facilitator	Supporting Documentation
1. Introductions and welcome	Bob Madden	
2. Background and history	Bob Madden	
Lake Lemon		
The LLCD	**************************************	
3. Overview of the Watershed Management Plan	Paul Amico	Preliminary TOC & list of figures
4. Objectives of the Planning Committee	Paul Amico	Planning Committee invitees & objectives
5. The Physiography of the Lake Lemon Watershed	Paul Amico	Topographic map
Topography		Slope map
Soil Types	-	Soils map
Land use/land cover	***************************************	Land cover map
6. Discussion of Issues of Concern	Paul Amico/Group	Flip chart
7. Sources of data	Paul Amico/Group	List of existing data
8. What's next?	Paul Amico	reliminary list of analyses & desired result
Malcolm Pirnie's intended course of action	494444900000000000000000000000000000000	Preliminary agenda for next meeting
Next meeting date		
Next meeting preliminary agenda		

Lake Lemon Watershed Management Plan Planning Committee Meeting #1 Summary Brown County Government Building June 27, 2000 7:00 PM

Meeting attendees: Bill Cobb, Lake Lemon Conservancy District

Bob Madden, Lake Lemon Conservancy District Ethel Wilkerson, Lake Lemon Conservancy District

Lloyd Wagler, Wagler Farms Shondra Zaborowski, IDNR Soils Paul Amico, Malcolm Pirnie

This document is a summary of the first Planning Committee meeting. The meeting agenda and supporting materials that were handed out at the meeting are included as a part of this summary.

Background Information

Bob Madden provided a brief history of Lake Lemon and the Lake Lemon Conservancy District (LLCD). The highlights are included below.

Lake Lemon and the Lake Lemon Conservancy District: Lake Lemon was constructed in 1956 as the primary drinking water source for the City of Bloomington and is the 11th largest lake in the state. Lake Lemon served as the water source until the mid-1970's. Lake Lemon is currently classified as the back-up water supply for the City of Bloomington and is managed by the Lake Lemon Conservancy District (LLCD). LLCD was established in 1995 by the Circuit Court of Monroe County in accordance with the Indiana Conservancy Act IC 14-33. LLCD has a 50-year lease on the lake from the City of Bloomington Utilities and operates, maintains, and manages Lake Lemon for recreation, wildlife habitat and water quality. The Lake Lemon Conservancy District is managed by a Board of Directors composed of one representative from each of the seven sub-districts that make up the conservancy district.

The Watershed Management Plan

The attached agenda packet includes the <u>Watershed Management Planning</u> cycle, which provides an overview of the process being used for this project. Also included is a preliminary draft of the proposed table of contents for the WMP document.

Overview: The Lake Lemon Watershed Management Plan (WMP) was initiated by the LLCD as a result of the sedimentation problem that is affecting the eastern end of the lake. The project is being funded through one part of a 104b(3) grant administered by the Indiana Department of Environmental Management (IDEM). The other part of the grant funds a design study that will provide for the dredging and relocation of the sediment that has accumulated in the eastern end of the lake¹. LLCD's consultant for the WMP is Malcolm Pirnie, an environmental consulting firm with a regional office in Indianapolis.

¹ Contact Bob Madden, Lake Manager, for more information on the design study project.



Objectives: The goal for the Lake Lemon WMP is to have a concise document that can be used by stakeholders within the Lake Lemon watershed to move forward on addressing the issues identified in the WMP. The document will highlight the primary water quality issues within the Lake Lemon watershed, identify the most problematic areas, and list actions that can be taken to correct the existing problems. The plan will also explore possible sources of funding available from state, federal, and non-governmental agencies to complete projects within the watershed.

Planning committee: The planning committee consists of representatives from stakeholder agencies and a member of the farming community within the Lake Lemon watershed. The objectives of the planning committee and the list of invitees are included in the attached agenda packet.

Physiography of the Lake Lemon Watershed

Paul Amico presented the attached maps showing the physical characteristics of the watershed. The maps detail available information on topography, slope, land cover, and soil types. This data will be used to identify areas within the watershed that are most likely to erode and contribute to the sedimentation problem in Lake Lemon. A table is included in the agenda packet that lists acreage of several of the watershed's physical characteristics.

Issues of Concern

A brainstorming session resulted in the following issues that the planning committee feels should be addressed in the watershed planning process:

- Sedimentation of the lake caused by surface erosion
- Frooding in Trevlac and other areas near the lake
- Failing septic systems
- Bacterial contamination
- Construction runoff
- Agricultural runoff

Future Meetings

The next planning committee meeting will be held in September. The planning committee invitees will be contacted in the coming weeks to get input on the next meeting date and time.

The objectives for the next planning committee meeting are:

- To present the areas most susceptible to erosion based on soil type, topography, and land cover;
- Discuss issues of concern;
- List any additional issues of concern;
- Discuss issue prioritization; and
- Discuss any additional sources of data.





Lake Lemon Conservancy District Lake Lemon Watershed Management Plan Planning Committee Meeting #2 September 19, 2000

Discussion Item	Facilitator
1. Introductions and welcome	Bob Madden
2. Objectives of the Planning Committee	Paul Amico
3. Overview of the Watershed Management Plan	Paul Amico
4. Watershed Characterization Chapter (Draft)	Paul Amico
5. Discussion of Issues of Concern	Paul Amico/Group
6. What's next?	Paul Amico
Malcolm Pirnie's intended course of action	
Next meeting date	

Lake Lemon Watershed Management Plan Planning Committee Meeting #2 Summary Monroe County Extension Meeting Room September 19, 2000 2:00 PM

Meeting attendees: Paul Amico, Malcolm Pirnie

Jim Farr, IDNR Soils

Becky Fletcher, Hoosier Heartland RCMD/NRCS Steve Glasgow, City of Bloomington Utilities Bob Madden, Lake Lemon Conservancy District

Lloyd Wagler, Wagler Farms

Ethel Wilkerson, Lake Lemon Conservancy District

Shondra Zaborowski, IDNR Soils

This document is a summary of the second Planning Committee meeting. The meeting agenda and supporting materials that were handed out at the meeting are included in Attachment 1 of the quarterly report.

Planning Committee Objectives: Paul Amico reviewed the objectives of the planning committee. The objectives and list of invitees are included in the meeting materials in Attachment 1.

Overview of the Watershed Management Plan: The goal for the Lake Lemon WMP is to have a concise document that can be used by stakeholders within the Lake Lemon watershed to move forward on addressing the issues identified in the WMP. The document will highlight the primary water quality issues within the Lake Lemon watershed, identify the most problematic areas, and list actions that can be taken to correct the existing problems. The plan will also explore possible sources of funding available from state, federal, and non-governmental agencies to complete projects identified in the WMP.

Table of Contents: Paul Amico presented the draft table of contents for the Lake Lemon Watershed Management Plan. The draft table of contents is included in the meeting materials in Attachment 1.

Watershed Characterization Chapter (Draft): Paul Amico presented GIS maps and figures contained in the watershed characterization report, which will be included as a chapter in the overall WMP. This data is being used to characterize the physical characteristics in the watershed and to identify human impacts on the watershed. Information gathered in the characterization will be used to identify areas within the watershed that are most likely to erode and contribute to the sedimentation problem in Lake Lemon.

Issues of Concern

A brainstorming session resulted in the following issues that the planning committee feels should be addressed at this stage of the watershed planning process:

Soils:

 The entire Lake Lemon Watershed contains highly erodible soils, which indicates that erosion of the stream channel itself may be the primary culprit of the sedimentation problem affecting the lake.



- The slope of the watershed's terrain and land cover are also extremely important factors that may affect sedimentation rates.
- More detailed information is needed on the soil types within the watershed. This information is contained in the Monroe and Brown County Soil Surveys, which are being forwarded to Malcolm Pirnie.

Land Ownership:

- Determining land ownership can be very important in prioritizing areas of concern. Private land owners are often not receptive to improvements on their property and most funding to correct Non-Point Source Pollution can not be used on public (PRIVATE???) lands.
- The City of Bloomington has shared its land ownership data for Monroe County but Brown County does not have its records in a readily accessible electronic format.
- It was suggested that Chuck Ratts (IDNR Forestry), Morgan-Monroe, Yellowwood State Forest, or Indiana Geologic Survey may have records on land ownership.

Other Issues:

- Land use changes
- Flooding in Trevlac
- Septic/Bacteria Issues

Future Meetings

The next planning committee meeting will be held on November 15th at 9:00 AM in the Monroe County Extension Meeting Room. A draft WMP will be forwarded to each of the planning committee members prior to the next meeting. This will allow members to review the document prior to the meeting and to bring comments and suggestions.

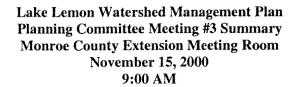
The objectives for the next planning committee meeting are:

- To discuss the draft WMP with the planning committee; and
- To discuss methods of implementation and other potential funding sources.



Lake Lemon C Lervancy District Lake Lemon Watershed Management Plan Planning Committee Meeting #3 November 15, 2000

Discussion Item	Facilitator	Supporting Documentation
1. Introductions and welcome	Bob Madden	Meeting agenda
2. Project Review	Paul Amico	Overhead
3. Watershed Characterization Review	Rick Shamblen	Мар
4. Issue Identification Review	Rick Shamblen	
5. Solution Identification (BMPs)	Rick Shamblen	Chapter 5 (Draft)
6. What's next?	Rick Shamblen	
Project Documentation Goals		
Next meeting date		Preliminary agenda for next meeting



Meeting attendees:

Paul Amico, Malcolm Pirnie

Bill Cobb, Lake Lemon Conservancy District

Jim Farr, IDNR Soils

Becky Fletcher, Hoosier Heartland RCMD/NRCS Steve Glasgow, City of Bloomington Utilities Bob Madden, Lake Lemon Conservancy District

Rick Shamblen, Malcolm Pirnie

This document summarizes of the third planning committee meeting for the Lake Lemon Conservancy District's Watershed Management Plan. The meeting was held at the Monroe County Extension Meeting Room on November 15 at 9:00 a.m. to 12:00 p.m. The meeting agenda and supporting materials used during the meeting are included in the attachments.

Meeting Purpose: The purpose of this meeting was to re-introduce Rick Shamblen of Malcolm Pirnie from Columbus, Ohio as the new "on-site" project manager. Paul Amico of Malcolm Pirnie resigned his position with Malcolm Pirnie. Moreover, the meeting was used to allow the planning committee an opportunity to help Rick Shamblen understand the project status, goals, needs and issues of concern.

Project Review: Paul Amico reviewed the overall objectives of the watershed planning process as presented during the project interview on November 13, 1999 (Attachment 2). The purpose of this review was to revisit the watershed planning process, actions completed and actions necessary to complete the watershed plan.

Rick Shamblen provided a summary of his understanding of the project status. The purpose of this brief review was to allow the planning committee the opportunity to communicate and clarify their needs of the watershed plan.

Watershed Characterization Review: Rick Shamblen provided a brief review of his understanding of the Lake Lemon watershed characteristics. The planning committee confirmed these understandings and added two additional sections be included. Pursuant to the previous planning committee meeting (September 19, 2000), the committee recommended that property ownership be identified within the watershed. The committee desires only a general understanding of general property ownership as it pertains to private and public lands. This understanding will enable the Conservancy District points of contact to address for specific conservation practices locations. The committee recommended that Rick contact the Yellow Wood State Forest Manger to identify the state property boundaries (See September 19 Meeting Minutes). The planning committee also recommended that a section that describes the characteristics of Lake Lemon and the Lake Lemon Dam. This section will help the watershed's stakeholders understand the Lakes characteristics as it pertains to flooding in upstream communities.

Communication and Outreach:



The planning committee requested that the Brown County Democratic Newspaper be contacted. The purpose of this contact is to invite a reporter to write an article about the watershed planning process, purpose and goals of the document. This information will be communicated to communities of Brown County.

A public meeting to present the findings of the planning committee is desired by the committee. Becky Flectcher of the Hoosier Heartland RCMD/ NRCS volunteered the RCMD's resources to host and facilitate the public meeting. The date was not identified or secured at this meeting.

Issues of Concern: Six issues of concern were identified during the first several planning committee meetings. These issues include 1) sedimentation of Lake Lemon, 2) flooding in Trevlac, 3) failing septic systems, 4) bacterial contamination, 5) construction runoff, and 6) agricultural runoff (Chapter 3). As a result of the watershed characterization report (Chapter 4), the planning committee recognized the need to aggregate several of these issues under common categories. Moreover, the planning committee prioritized these issues of concern based on ability to initiate action soon after completion of the watershed management plan. After thorough discussions, the issues of concern were compiled and prioritized into three categories. They are:

Sedimentation
 In-channel erosion
 Agriculture Runoff
 Construction Runoff

2) Bacteria Contamination Failing Septic Systems Agricultural Runoff Natural Sources

3) Flooding

The ranking prioritization of these issues was primarily based on the Lake Lemon Conservancy District's capability to quickly begin addressing these issues soon after completion of the Watershed Management Plan. The planning committee recommended that the sedimentation in Lake Lemon be addressed initially with a Demonstration Project of in-stream erosion control. The committee believes sedimentation and erosion control can be effectively implemented and demonstrates a positive effect quickly. The planning committee also recognizes that additional analyses and funding will be necessary to address failing septic systems in the watershed. Lastly, the committee recognizes the complex nature of the flooding in Trevlac and the need for a comprehensive hydrologic analysis of the system prior to recommending specific actions.

Best Management Practice Review:

A draft copy of Evaluation of Potential Solutions, Chapter 5 (Attached 3) was provided to the watershed planning committee. The committee recognized that there are a vast number of types of BMPs suitable for meeting water quality concerns in Lake Lemon. Specific BMPs used for nonpoint source pollution control are site specific and must be adaptable by individual landowners. Rick Shamblen offered the idea to develop a BMP matrix that correlates geographically common BMPs suitable for the identified issues of concern. Rick also suggested that NRCS and SWCD staff review the BMP matrix. Jim Farr with IDEM offered to lead the technical review of the BMP matrix.



Action Items:

- 1. Jim Farr with the IDNR Soils will contact Alvin ???, Soil Scientist with IDNR. Alvin ??? will become the new XXXXX a.
- 2. Jim will contact Doug Keller, stream biologist also with IDNR. Doug will be invited to participate in a stream walk to identify four or five potential sites in need of restoration.
- 3. Becky Fletcher, Hoosier Heartland RCMD, NRCS, will identify a facilitator for the public outreach meeting.
- 4. Identify major property ownership of the watershed, specifically the identification of public versus private property.
- 5. Identify four or five sites of high erosion be identified along Beanblossom Creek in need of stream corridor restoration.
- 6. Rick Shamblen will develop draft BMP matrix to be reviewed by IDEM, NRCS and SWCD.
- 7. Rick Shamblen will begin writing draft implementation plan (Chapter 7).

Future Meetings

The next planning committee meeting will be held during the first several weeks of December. The meeting date will be secured with Jim Farr and Bob Madden. The purpose of the meeting in December will be to conduct the stream channel tour and review updates to the watershed management plan. A draft WMP will be forwarded to each of the planning committee members prior to the next meeting. This will allow members to review the document prior to the meeting and to bring comments and suggestions.

The objectives for the next planning committee meeting are:

- Stream channel tour to identify potential restoration site; and
- Review status of watershed management plan.



Lake Lemon C ervancy District Lake Lemon Watershed Management Plan Planning Committee Meeting #4 April 10, 2001

	Discussion Item	Facilitator	Supporting Documentation
1.	Introductions and welcome	Bob Madden	Meeting agenda
2.	Watershed Characterization Review: Chapter 5: BMP Review	Rick Shamblen	Chapter 5 (Draft)
3.	Watershed Characterization Review: Chapter 6:	Rick Shamblen	Chapter 6 (Draft)
	A. Implementation Plan	Rick Shamblen	
	B. Funding Strategies and Resources	Rick Shamblen	
4.	Watershed Tour: Identification of Potential Priority Restoration Sites	Rick Shamblen	Agenda for April 11 Tour
5.	Public Relations: Coordinating Outreach	Bob Madden	
6.	Wrapping Up:		
	Coordinating Plan with Schneider Engineering Report: Status	Rick Shamblen	
	Next meeting date		

Lake Lemon Watershed Management Plan Planning Committee Meeting #4 Summary Monroe County Extension Meeting Room April 10, 2001 1:30 PM

Meeting attendees: Jerod Chew, DNR Soils

Bill Cobb, Lake Lemon Conservancy District

Jim Farr, IDNR Soils

Bob Madden, Lake Lemon Conservancy District

Rick Shamblen, Malcolm Pirnie

Todd Stevenson, Monroe Co. Highway Department Ethel Wilkerson, Lake Lemon Conservancy District

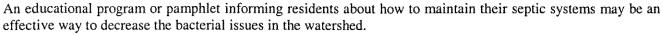
This document summarizes the fourth planning committee meeting for the Lake Lemon Conservancy District's Watershed Management Plan. The meeting was held at the Monroe County Health Department's Meeting Room on April 10th from 1:30 P.M. to 3:30 P.M. The meeting agenda and supporting materials used during the meeting are included in the attachments.

Meeting Purpose: The purpose of the Lake Lemon Watershed Management Planning committee is to help identify the issues of concern for the Lake Lemon watershed; to assist in the prioritization of those issues; and to help develop possible solutions. The objectives of the April planning committee meeting were to continue reviewing the draft of Chapters 5 and 6 of the Watershed Management Plan document; evaluate potential restoration sites; and discuss public outreach. The meeting agenda is attached as Attachment 1.

Chapter 5: Best Management Practices (BMP)Review: Rick Shamblen reviewed the main issues for the Lake Lemon Watershed Management Plan, as identified by the planning committee. These issues are sedimentation of the East end, bacteria, and flooding. Shamblen stated specific actions taken to address these issues could be identified by a BMP matrix (Attachment 2). The matrix lists recommended BMPs developed by the USDA, their effectiveness in controlling sediment, pathogens, and absorbed and soluble nutrients, and the effectiveness of the implementation. Based on these characteristics, the BMPs were ranked resulting in three recommended BMPs for use in the Lake Lemon Watershed. The three recommended BMPs are nutrient management programs, streambank and shoreline protection, and waste management systems.

Additional Comments on Issues of Concern or BMPs: Rick Shamblen asked if the committee members had any questions or comments about the information presented. The following is a summary of the questions and suggestions of the committee members.

There are no BMPs addressing the flooding issue because Lake Lemon was not designed to be a flood control lake. The plan will explain the limited capabilities of the sluice gate to remove water from the lake and specifically state that a flood study must be completed in order to address the flooding problems upstream of Lake Lemon, in Trevlac. Todd Stevenson stated the Federal Emergency Management Agency (FEMA) is responsible for funding flood studies and he would try to send more information to Rick Shamblen.



In Monroe County there are slope restrictions in place on timber harvesting within the Lake Monroe and Griffy watersheds. The plan may include lobbying the Monroe and Brown County Planning Committees to adopt the slope restrictions in the Lake Lemon Watershed.

The ownership of land in the watershed may be determined by contacting Jim Allen, IDNR Forestry.

Watershed Tour: Some committee members, as well as individuals from Indiana Department of Environmental Management (IDEM), will tour the watershed tomorrow at 10:30 A.M. to identify specific site of concern that will benefit from the application of BMPs.

Communication and Outreach: A public meeting to present the findings of the planning committee is desired by the committee. The target time for the public meeting is July and it was suggested the meeting be held at the new public library in Nashville. Becky Fletcher of the Hoosier Heartland RCMD/ NRCS has volunteered to facilitate the public meeting.

Future Meetings: The next planning committee meeting will be held in July. The meeting will take place in the afternoon before the evening public meeting. The exact date or time of the meeting has not yet been established. The purpose of the next meeting will be to address any last minute concerns and to finalize the watershed management plan. Before the meeting, a draft of the plan will be mailed to each committee member. The committee members are asked to review the plan, make comments on the document, and return the comments to Rick Shamblen. Rick will compile all the comments from the various committee members for the final draft.

The objectives for the next planning committee meeting are:

- Review the compiled draft of the management plan; and
- Discuss the evening public meeting.



LAKE LEMON WATERSHED MANAGEMENT PLAN

WATERHED PLANNING COMMITTEE

Brown County Public Library Nashville, Indiana

August 1, 2001

4:00pm

AGENDA

Welcome and Introductions

Bob Madden, Lake Lemon Conservancy District

Watershed Key Findings Presentation Review Rick Shamblen, Malcolm Pirnie, Inc.

Draft Watershed Management Plan Review Rick Shamblen, Malcolm Pirnie, Inc.

Facilitating Public Participation
Becky Fletcher, Hoosier Heartland RC&D

End

LAKE LEMON WATERSHED MANAGEMENT PLAN

PLANNING COMMITTEE MEETING

Brown County Public Library Nashville, Indiana

August 1, 2001

4:00pm - 6:00pm

Meeting Minutes

Attendees

Alvin Balmer, NRCS
Jerod Chew, Brown SWCD
Bill Cobb, LLCD
Jim Farr, IDNR, Division of Soil and Water Conservation
Becky Fletcher, Hoosier Heartland RC&D
Steve Kale, Brown County Health Department
Bob Madden, LLCD
Rick Shamblen, Malcolm Pirnie, Inc.
E.nel Wilkerson, LLCD

The purpose of the planning committee meeting was to review comments and issues about the draft Lake Lemon Watershed Management Plan. The draft report was mailed to the planning committee members on June 30, 2001. Also, the meeting was to prepare and review the agenda for the watershed public meeting slated for 7:00pm later that same day.

Bob Madden opened the meeting with introductions by committee members present. Bob indicated that his office facilitated the advertising for the public meeting notification and included notification in the Brown County paper, Bloomington paper and mailing of 500 cards to Lake Lemon Conservancy District members (Attachment X).

Rick Shamblen handed out a copy of the public meeting agenda and reviewed with the committee (Attachment 4). Rick presented and made minor adjustments to the presentation about the Watershed Management Plan Key Findings (Attachment 3).

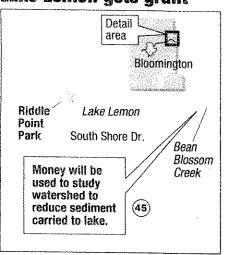
Becky Fletcher presented the Nominal Group Technique (NGT) process she planned to use to facilitate the public's participation in the identification and prioritization of issues of concern for Lake Lemon and it's watershed (Attachment 6). Becky presented the ground rules and sought assistance from the planning committee to aid the process.

Rick Shamblen requested comments about the draft watershed management plan. Discussion about actions regarding fecal coliform contamination of the reservoir were examined and pursued by Steve Kale. Steve provided information and local knowledge of the Brown County Health Department issues about enforcement of private septic system management. Steve indicated that grants could be made available for Helmsburg and Trevlac communities to address septic system management. Trevlac has been identified as a potential source of fecal coliform contamination in Lake Lemon. Bob Madden recommended that Steve and Rick Shamblen discuss this issue further in order to incorporate these measures into the revised Lake Lemon Watershed Management Plan.

APPENDIX C

Grant will broaden studies at lake

Lake Lemon gets grant



STAFF MAP BY KATHERINE PASTEL

Lake Lemon watershed to be examined for solutions to sedimentation problem

By Steve Hinnefeld

H-T Staff Writer

For several years, Lake Lemon officials have used state funding to stabilize the eroded shoreline of the 1,650-acre lake.

Now they're taking their efforts upstream.

The Lake Lemon Conservancy District has received a \$98,500 state grant to study the lake's 70-square-mile watershed and make plans to reduce sediment carried to the lake by Bean Blossom Creek.

"We're moving up into the watershed," said Lake Lemon manager Bob Madden. "If you can fix problems in the watershed, then they don't become bigger problems when they get down to the lake."

The grant comes from the Indiana Department of Environmental Management, using money provided by the U.S. Environmental Protection Agency. The conservancy district will provide \$4,925 in matching funds.

Lori Kaplan, commissioner of the state environmental management department, praised Lake Lemon management for its approach to heading off erosion and sediment problems.

"A watershedwide approach is the best way to deal with these kinds of issues," Kaplan said. "The district has a sound plan in place to determine the causes and solutions for excess sedimentation in Lake Lemon."

The lake, located in northeastern Monroe County, was built in the 1950s as Bloomington's primary water-supply reservoir. It served that role until Lake Monroe was completed in the 1960s.

With 24 miles of shoreline, it is the 11th-largest lake in Indiana.

Boaters have access to the lake from the North Shore Marina and Riddle Point boat ramps. And Riddle Point Park on Lake Lemon is open to the public for picnicking, fishing and sunbathing but not swimming.

The Lake Lemon Conservancy District, a local government unit with taxing powers, was created in 1995 to manage the lake, which is still owned by the city of Bloomington utilities department.

Madden said the district has received about \$200,000 from the Indiana Department of Natural Resources to protect and restore the lake's shoreline.

▶See LAKE LEMON / C3

Grant will broaden studies at Lake Lemon

▼Lake Lemon / from C1

Next month, it will award contracts for work this summer to stabilize 1,000 feet of shoreline near Riddle Point. And it's continuing to apply for additional funding from the DNR's Lake and River Enhancement fund.

But fixing the lakeshore doesn't solve all of Lake Lemon's environmental problems. In particular, it doesn't deal with erosion that makes its way to Bean Blossom Creek and flows downstream to the lake.

About 80 percent of the Bean

Blossom Creek-Lake Lemon watershed is in Brown County and the rest is in Monroe County, Madden said. Most is thought to be wooded land with some in agricultural use.

The most recent state grant will pay for two projects, Madden said.

One is a study of the watershed and development of a watershed management plan. The idea is to identify areas and practices in the watershed that contribute to sedimentation and look for ways to address them.

The second part will study ways to reduce and remove sediment from the shallow east end of the lake where officials estimate 500 to 600 acres of the lake have been lost to sedimentation.

Madden said Lake Lemon officials will work with public officials and property owners in Brown and Monroe counties on the project.

"We're putting together a planning team made up of professionals, stakeholders and interested parties in both counties to help us develop and formulate this plan," Madden said.

Reporter Steve Hinnefeld can be reached at 331-4374 or by e-mail at

The Bloomington

Herald Times

7-16-2000

Lake Lemon gets grants for study

Although Lake Lemon straddles the border between Brown County and Monroe County, like Lake Monroe to the south, it has its entire watershed within Brown County.

And like Lake Monroe. Lake lemon will now be the subject of an intensive study of it's watershed area with the purpose of unproving water flow to the lake from Bean Blossom Creek.

The Indiana Department of Environmental Management recently announced a \$98,500 grant to the Lake Lemon Conservancy District to fund the study of the lake's watershed and the flow of Bean Blossoro Creek.

The watershed for Lake Lemon is 70 square miles. The major waterway in that watershed is Bean Blossom Creek, which winds across northern Brown County with head waters near Spearsville and Gatesville.

We appland the efforts of the Lake Lemon Conservancy District and find that this is processely the type of project which men'ts funding in this program," said Lori Kaplan, an IDEM commissioner.

"A watershed-wide approach is the best way to deal with these kinds of issues. The district has a sound plan in place to determine the causes and solutions for excess sedimentation in Lake Lemon."

The Conservancy also recently received a \$78,750 state grant from the Department of Natural Resources to help stabilize that shoreline and prevent erosion at Lake Lemon.

Lake Lemon serves as a back-up water supply for Bloomington.

Sedimentation picked up by Bean Blossom Creek flows to Lake Lemon and results in the blockage of the flow into the lake. The increased sodimentation results in low dissolved oxygen levels in the lake which can be harmful to plants and aquatic life.

The watershed project will include:

 Organizing a planning team made up of conservancy district staff, representatives from subcontractors and interested area residents. The planning team will develop a strategy to identify specific actions to address water quality in the watershed:

- Developing features of the watershed by compiling existing watershed data and gathering maps of the area of concern;
- Surveying the mouth of the creek to determine current and future levels of sedimentation; and
- Producing a written watershed plan outlining the watershed characterization and surveys. The plan will include priority issues, current and expected sedimentation levels and proposals for remedying the problem.

The planning process will be organized and facilitated by the conservancy district.

The project will provide plans to remove sediment from the lake for navigation and increase of wildlife habitat. This could be created with wetland-containing islands near the mouth of Bean Blossom Creek.

Funds for the grant come from money allotted to IDEM by the U.S. Environmental Protection Agency under the Clean Water Act. The Lake Lemon Conservancy District will provide a grant match of \$4.925.

The \$78,750 shoreline stabilization grant is part of \$1.1 million in state funding for water-quality projects in 32 Indiana counties.

Lake Lemon Conservancy District manager Bob Madden said the grant will enable officials to complete the restoration of nine eroded sections of shoreline identified in a 1997 study.

This is the fifth grant the conservancy has received in the past five years from the state Department of Natural Resources Lake and River Enhancement program.

The DNR grants are funded with a SS state charge on boating license fees.

—Jeff Tryon

Brown County Democrat
8-23-2000





http://www.state.in.us/idem

For Immediate Release: May 23, 2000

Contact: Russ Grunden (317) 232-8499 rgrunden@dem.state.in.us

IDEM Awards Grant for Lake Lemon Watershed Project

The Indiana Department of Environmental Management announced today that it has awarded a \$98,500 grant to the Lake Lemon Conservancy District near Bloomington. The grant will be used to study the Lake Lemon watershed and develop a plan for improving water flow to Lake Lemon from Bean Blossom Creek.

"We applaud the efforts of the Lake Lemon Conservancy District and find that this is precisely the type of project which merits funding in this grant program," said Lori F. Kaplan, commissioner of IDEM. "A watershed-wide approach is the best way to deal with these kinds of issues. The district has a sound plan in place to determine the causes and solutions for excess sedimentation in Lake Lemon."

Lake Lemon, 10 miles northeast of Bloomington, is the state's 11th largest lake comprising 1,650 acres and 24 miles of shoreline. The watershed for the lake is 70 square miles and the major waterway in the watershed is Bean Blossom Creek. Lake Lemon serves as a backup drinking water supply for the city of comington.

Sedimentation, picked up by Bean Blossom Creek, flows to Lake Lemon and results in blockage of the flow into the lake. The increased sedimentation results in low dissolved oxygen levels in the lake which can be harmful to plants and aquatic life.

The project will include:

- Organizing a planning team made up of conservancy district staff, representatives from subcontractors, and interested area residents. The planning team will develop a strategy to identify specific actions to address water quality in the watershed;
- Developing features of the watershed by compiling existing watershed data and gathering maps of the area of concern;
- Surveying the mouth of the creek to determine current and future levels of sedimentation; and
- Producing of a written watershed plan outlining the watershed characterization and surveys. The
 plan will include priority issues, current and expected sedimentation levels and proposals for
 remedying of the problem.

Funds for the grant come from monies allocated to IDEM from the U.S. Environmental Protection Agency and are authorized by section 104(b)(3) of the Clean Water Act. The Lake Lemon Conservancy District will provide a grant match of \$4,925.



-30-

Additional contact: Bob Madden, lake manager, 812-334-0233

BACKGROUND AND ADDITIONAL INFORMATION SHEET LAKE LEMON CONSERVANCY DISTRICT WATERSHED MANAGEMENT GRANT

Lake Lemon is Indiana's 11th largest lake, covering approximately 1,650 acres with about 24 miles of shoreline. It was constructed in 1953 for flood control, recreation, and as a source of drinking water for the City of Bloomington. The lake was used for drinking water from the mid-1950s to the mid-1970s and now serves as a back-up water supply source for the City. Lake Lemon's watershed, the drainage basin from which all streams flow, is approximately 70 square miles. Land use activities in the watershed include recreation, agriculture, forestry, and rural communities. Recent studies by Indiana University and the Indiana Department of Natural Resources indicate shoreline erosion, sedimentation, and aquatic plant growth affect the quality of the lake.

In response, the Lake Lemon Conservancy District (LLCD) sought and received two grants totaling \$98,500 from the Watershed Grants Program of IDEM. The purpose of these grants is to address both the symptoms and potential causes of the impacts to Lake Lemon.

One of the grants provides approximately \$38,500 to initiate watershed management planning activities in order to 1) compile and interpret existing water quality data, 2) gather and map information on potential sources of pollution and, 3) identify and prioritize land use practices to reduce the most important watershed problems. The planning process will be organized and facilitated by the Lake Lemon Conservancy District, and will involve all those with a stake in the management of the watershed.

The other grant provides approximately \$60,000 for a design study focused on addressing the sedimentation problem at the eastern portion of the lake. The project will provide plans to remove sediment from the lake for navigation and increase wildlife habitat. This could be created with wetland-containing islands near the mouth of Beanblossom Creek.

These two projects will result in numerous benefits including:

- Improved navigation in the channel in the east end of Lake Lemon;
- Creation of additional animal and plant habitat in the watershed;
- Improved communication among stakeholders in the Lake Lemon Watershed; and
- An increased awareness of the lake as an important resource for the residents of south-central Indiana.

Questions about the two projects should be directed to Bob Madden, Lake Manager, at (812) 334-0233.

LAKE HAS NEW LEASE ON LIFE





Conservancy efforts have sparked lake renaissance

Conservancy has sparked Lake Lemon renaissance

and a community resource that had been sadiy. neglected. I could see it change ... the decline and neglect. We just fett like an attempt should be made to preserve it. 🤫



Manager proud of 'pristine' Lake Lemon

By Marda Johnson Sunday Hereld-Times

UNIONVILLE — Lake Lemon manager Bob Madden clearty enjoys his work.

The seemingly endless number of projects that could improve the lake energizes him, and the growing list of tasks already tackled encourages him.

Madden has maps and photos to help illustrate the challenges and successes of the 50-yearold reservoir. Better yet, he has the lake itself right outside his office door — and he offers it up as testament to the success of the 5-year-old Lake Lemon Conservancy District.

As Madden maneuvered his patrol boat around the lake recently, he talked about the health of the lake.

"It is pristine. The water is clean," he said.
"This place is really alive right now, and that's

Lake Lemon has about 550 freeholders, mak-

ing it the summer or year-round home to about 2,000 people. The 1,650-acre lake has 24 miles of shoreline and is the 11th-largest lake in Indiana. It is in the northeast comer of Monroe County, and crosses into Brown County.

Boaters have access to the lake from the North Shore Marina and Riddle Point boat ramps. Riddle Point Park on Lake Lemon is open to the public for picnicking, fishing and sunbathing. Two sailing clubs are located on the lake.

See MANAGER / A10

Manager Bob Madden proud of Lake Lemon's 'pristine' condition

▼Manager / from A1

People come from all over the region to boat, fish and ski, Madden said, noting the lake is the secondbest bass take in southern Indiana.

"And it's a better salling take than Monroe," Madden said. "I think it's the best salling lake in Indiana."

The conservancy district's biggest challenge right now is trying to solve a problem with sedimentation on the lake's east end.

An area of about 500 acres has become shallow and impossible to navigate because of sedimentation. The conservancy district earned a Department of Natural Resources grant to figure out how to improve the area. The district also has won funds to look at ways to reduce the funds to look at ways to reduce the

erosion from Bean Blossom Creek to slow down sedimentation.

At the other end of the take is the original earthern dam, which Madden said was well-designed and continues to function well.

In between, Madden pointed out signs of progress made in the past five years.

Weeds are being managed and a fish study is planned. Several areas of once-enoding shoreline now are protected with pieces of stone called rip rap — projects the conservancy has accomplished with grant funding.

Madden also pointed out a series of private projects.

Many property owners have started protecting their own shorelines and making improvements to their cottages and homes. Madden said the right type of government, a strong board, a good landlord, exceptional human resources and knowledgeable management have come together to make take Lernon a success story that others want to irritate.

He has been called upon by lake management and parks groups to tell Lake Lermon's story. And Madden said he points to those five key factors when he talks about the turnabout of the once-threatened reservoir.

Madden said the foresight of Earl Eberle, Larry Ritter and Bud Howard to form a small local government was the most important contribution to the lake's success.

"You've got to tip your hat to them for picking a conservancy dis-

trict,* Madden said.

Their choice allows the caretakers of the lake to take advantage of programs offered to governments, but to be managed like a business, Madden said.

Madden said the board is the second component of success.

"They don't just go to a once-amonth meeting." Madden said. "They meet with homeowners. It's a very active board."

Another important element is the relationship between the city utilities department and the conservancy district. The utilities department actually owns the lake and has leased it to the conservancy.

Madden said that when the conservancy district wins a grant, the utilities department shares in paying the matching funds.

"They provide us with a lot more resources and support that enable us to be successful," he said. He said the utilities board also is

interested in preserving the undeveloped property around the lake.

"We have miles of shoreline that is natural." Madden said

The availability of competent staff from Indiana University is a fourth factor in the conservancy's success.

"We've been able to surround the organization with really top-notch people because of the university." Madden said.

The staff includes Ethel Wilkerson, who has a bachelor's degree in biology and is employed as office manazer and lake biologist while she works on a double master's degree at Indiana University.

Madden is the conservancy district's only year-round, full-time employee, and he claims a small share of the credit, as well

"I've had a linde part in facilitating it," said Madden, who was deputy director of the Indianapolis parks program before coming to Lake Lemon. "I come with 20 years of experience getting grants. Hopefully, I came in with a little bit of management experience and skin anagement experience and skin anageme

"All of those ingredients have come together," he said, "It's been a wild ride and such a good ride. It's been a good thing."

Marda Johnson can be reached at 331–4373 or by e-mail at michnson@heraldt.com.

Public Notice

The Lake Lemon Conservancy District will host a meeting on August 1, 2001 to present the work completed on the Lake Lemon Watershed Management Plan and the design study for sediment removal on the east end of the lake. Both projects were funded by an Indiana Department of Environmental Management 104b3 grant of \$98,500.00 awarded to the Conservancy District in February 2000. The agenda includes outlining the issues of concern for the Lake Lemon watershed potential solutions to these problems, funding sources for stakeholders, the presentation of the design plans for sediment removal, and an opportunity for public comment and questions. The public is invited to attend this meeting to learn the details of both plans, ask questions of the authors and engineers, and give their comments and suggestions about the current status of these projects. The meeting will be held in the public meeting room B at the Brown County Public Library, 205 Locust Lane, Nashville, Indiana from 7PM-9PM. Individuals with questions prior to the meeting may contact the Lake Lemon Conservancy District at (812) 334-0233.

Conservancy board to hear erosion study

The Lake Lemon Conservancy District will hold a public meeting at 7 p.m., Tuesday, December 18, at the Brown County Public Library to discuss the east end design plan.

Those attending the meeting will hear a presentation by Schneider Engineering.

The Indianapolis-based firm will discuss the results of a two-year study used to determine the best way to handle fifty years of erosion and sedimentation that has filled a

quarter of the lake, according to lake manager, Bob Madden,

The district received \$57,000 grant money from the Indiana Department of Environmental Management and \$3,000 from the conservancy to pay for the study.

After their recommendation Mr. Madden said the next step is to raise the \$2 to \$3 million price-tag to correct the problem.

-Judy Umphrey

BROWN

Lake Lemon lot owners to meet

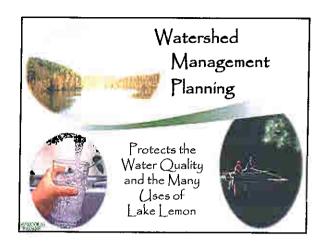
Property owners in the Lake Lemon Conservancy District are invited to a meeting Tuesday to discuss a design plan for improvements to the east end of the lake.

The meeting will be 7 p.m. Tuesday at the Brown County Public Library in Nashville.

Schneider Engineering will make a presentation of the plan, followed by a discussion. Freeholders and members of the public are invited.



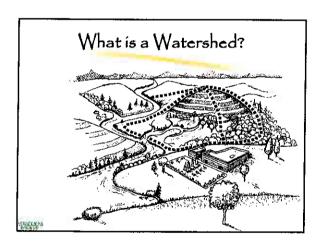


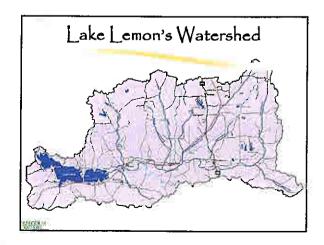


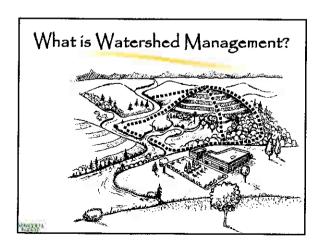
Discussion for Today's Meeting

- What is a watershed?
- What is watershed management?
- Why is watershed management needed?
- How is watershed management accomplished?
- What should we expect?
- What are the benefits?

SHEET.



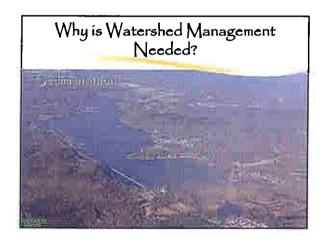




Watershed management planning organizes stakeholders to develop a plan identifying specific actions to address identified water quality concerns within the watershed.

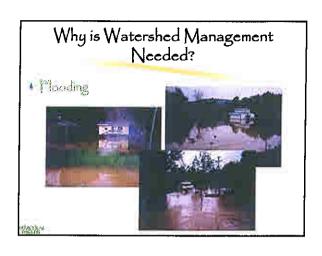


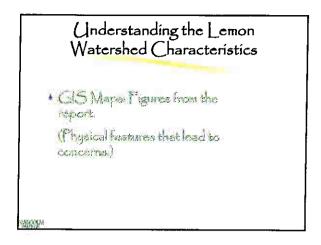


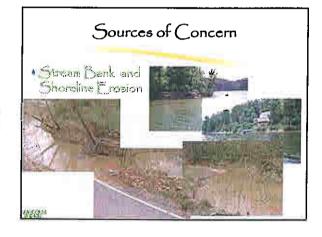


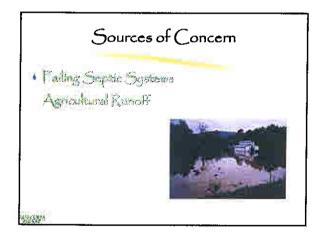


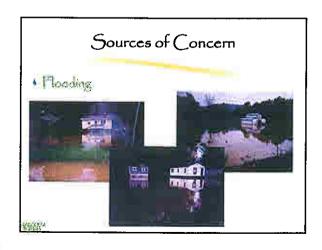














Recommendations

* Aquatic Macrophyte Control – Implement the Lake Lemon Aquatic Macrophyte Control Plan (2000)

Recommendations

- On-Sito Soptic System Management
- · Pasture Management

900000021

Recommendations

*Flood Study

AROUM

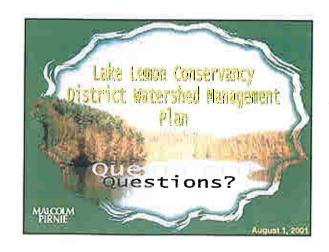
Recommendations

Measuring Success

Continue Annual Water Quality Monitoring Program with Dr. Bill Jones, Indiana University.

A HOUSE

Sediment Control	
Rodary uit Dranging	
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Servereiner Stabilization	I delicate a service de
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Partier, Management	Marie Street
Blooking	



APPENDIX E

Nominal Group Technique (NGT)

Ranking for Consensus

Why use it?

Allows a group to quickly come to a consensus on the relative importance of issues, problems, or solutions by completing individual importance rakings into a group's final priorities.

What does it do?

- Builds commitment to the participants' choice through equal participation in the process.
- Allows every participant to rank issues without being pressured by others.
- Puts quiet participants on an equal footing with more dominant participants.
- Makes the group's consensus (or lack of it) visible; the major cause(s) of disagreement can then be discussed.

How it is done -

- 1. Generate the list of issues, problems, or solutions to be prioritized (this may be done in writing) by using a brainstorming process. Or, in the case of the Lake Lemon public meeting, we reviewed issues that have been generated by others and asked for additions.
- 2. Write all statements on a flip chart or board.
- 3. Eliminate duplicates and/or clarify meanings of any statements (always ask for participants' permission to make changes or combine).
- 4. Record the final list of statements on a flip chart or board (do not number the issues since that would imply a type of prioritization to some people it also confuses the ranking process). You may also circle or mark issues if time is running short. Review aloud the issues to be ranked.
- 5. Each participant records the corresponding letters on a piece of paper and ranks the order of issues/concerns/statements. For instance if you have five issues, a person may assign the following ranking:

44

B 5

C 3

D 1

E 2

(At the Lake Lemon meeting we used 5 as most important ranking and 1 as least important.)

- Combine the rankings of all participants and write vote along side the issue large enough for all participants to see. If space and time is available it is better to also write the issues in priority order.
- 7. The participants are asked if they agree with ranking.

Weighted multi-voting

Assigning weight is a way to further check the degree of consensus among the group in a short amount of time.

At the Lake Lemon Public meeting, each participant rated the issue and placed their vote (using post it notes) on their top 5 issues. (5 was the highest priority, 1 was the lowest).

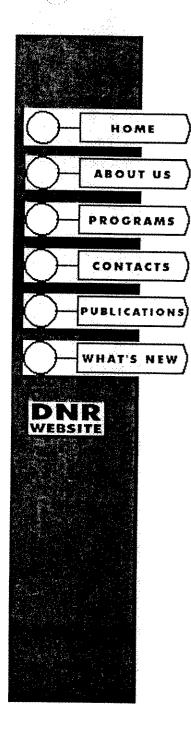
The weight of the issue (as explained above in ranking) along with the number of votes (actual number of post it notes) per issue gave us a better idea of the number of people at the meeting who rank the issue as important (a larger body of consensus). Both the total of the ranking and the number of votes are recorded so that it looks like this:

Issue B: 43/7

43 is the total points given by all participants; 7 is the number of people placing the vote. (If you have a group of 10 and 7 people voted for that issue it indicates a higher amount of consensus among participants.)

Important: Using this process, the top issues usually fall cleanly out (numbering 5-7 when working with a group of 25-30 issues; 5-10 if working with 35-45 issues). It is important to go down the list of issues and how they rank until there is a clear break. If rankings are close with 10 or more out of a group of 25-30 issues that may mean consensus is low and more discussion is needed, maybe even another meeting. So if you need a definite top 5 or top 7, etc. then you will need to discuss more and go through the rating process again.





Division of Soil Conservation

LAKE & RIVER ENHANCEMENT PROGRAM

The Division of Soil Conservation's Lake and River Enhancement Program (LARE) was developed to ensure the continued viability of public-access lakes and streams. The program's goal is to utilize a watershed approach to reduce non-point source sediment and nutrient pollution of Indiana's and adjacent states' surface waters to a level that meets or surpasses state water quality standards.

To accomplish this goal, the Division provides technical and financial assistance for qualifying projects. Approved funding may be used for one or more of the following purposes:

- 1) Investigations to determine what problems are affecting a lake/lakes or stream segment.
- 2) Evaluation or identified problems and effective action recommendations to solve those problems.
- 3) Cost-sharing incentives to land users in a watershed above the project lake or stream for installation or application of sediment and nutrient reducing practices on their land.
 - 4) Matching federal funds for qualifying projects.
- 5) Watershed management plans. (development and design)
- 6) Feasibility studies to define appropriate lake and stream remediation measures.
- 7) Engineering designs and construction of remedial measures.
 - 8) Water monitoring of Indiana's lakes.

Technical assistance to this program is provided through the Division's land/water conservation chief, engineer, aquatic biologist, and field staff.



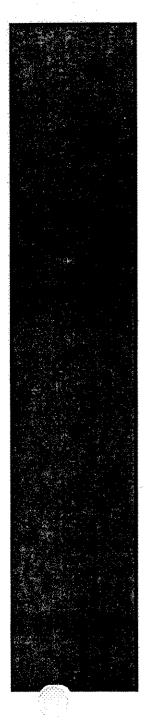














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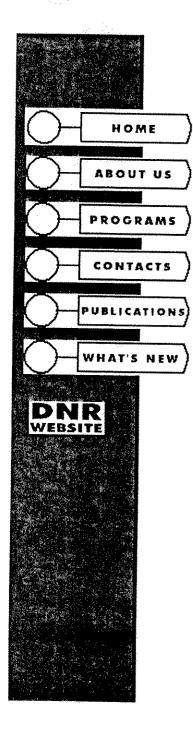
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Division of Soil Conservation

CLEAN WATER INDIANA PROGRAM

Much of Indiana's economic well being is tied to the soil resource. Yet every year, over 100 million tons of the resource are lost through erosion by wind and water.

The long-term costs of erosion to Indiana include decreased soil productivity, reduced property values, impaired water use, and deteriorated water quality. Effective erosion control, on the other hand, would save all taxpayers (not just landusers) millions of dollars annually, ensure the viability of our soil-based economy, and preserve our water resource.

Recognizing this, the state of Indiana has underscored its commitment to solve its erosion/sedimentation problems by establishing a program called Clean Water Indiana.

The Clean Water Indiana initiative...

- 1) Focuses state resources to reduce water pollution from agriculture and urban stormwater runoff;
- 2) Improves land management within watersheds to improve water quality, while sustaining productivity;
- 3) Utilizes technical and financial resources to assess natural resource conditions and implement the appropriate conservation measures;
- 4) Supports local assessment and prioritization of natural resources; and
- 5) Expands on the successes of the T by 2000 program.







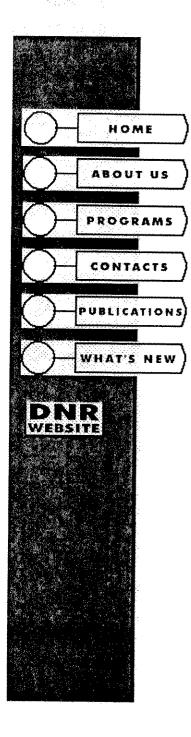




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Division of Soil Conservation

AGRICULTURE CONSERVATION

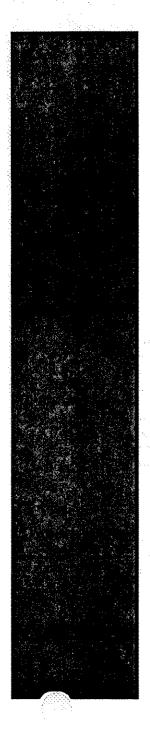
One of the objectives of Clean Water Indiana is to reduce erosion occurring on agricultural land, along with associated nutrient transport. Thus, the goals of the Division's agriculture conservation efforts include:

- 1) reducing soil erosion on each acre of agricultural land to "T" or below, and
- 2) controlling all off-site sedimentation from agricultural land by the application of best management practices (BMPs), as well as reduce off-site movement of nutrients that could adversely affect surface water quality.

Services available to agricultural land users through the Division's Agricultural Conservation Program include:

- 1) Assemblage of information required for creating or revising resource conservation management plans
- 2) Generation of on-site evaluations that determine type and extent of erosion and nutrient problems present
- 3) Assistance in the selection, design, and location of specific conservation practices
- 4) Supervision of installation and subsequent maintenance of practices selected
- 5) Assistance to land users in the utilization of local, state, and federal erosion and nutrient control cost-share programs and application processes

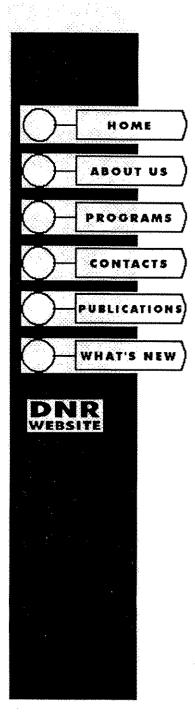




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Division of Soil Conservation

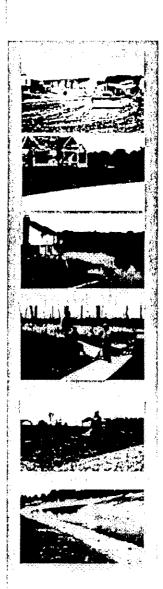
STORMWATER & SEDIMENT CONTROL PROGRAM

The Division of Soil Conservation's Stormwater and Sediment Control activities address soil erosion/sedimentation concerns associated with non-agricultural lands. This includes construction activities associated with residential, commercial, institutional, industrial, public, and special land uses.

The goal of the program is to control soil erosion and off-site sedimentation from non-agricultural lands, especially those undergoing development, to minimize adverse impacts on water quality.

Services available to non-agricultural land users through the Division's Stormwater and Sediment Control efforts include:

- 1) Technical assistance to non-agricultural land users and to government units
- 2) Information and training on selection and installation of erosion and sediment control practices
- Technical assistance in the review and revision of erosion and sediment control plans for non-agricultural areas
- 4) Assisting city and county authorities in development of regulatory programs to control and reduce the impact of erosion and sedimentation
- 5) Conducting educational programs for private and governmental sectors on interpreting and using soil conservation information and available resources
- 6) Developing educational programs on erosion control and sedimentation methods
- 7) Coordinating with IDEM on implementation of 327 IAC 15-5 (Rule 5), a state regulation aimed at minimizing off-site damages from construction site erosion and sedimentation
- 8) Providing comments and conducting on-site evaluations for IDNR, Division of Water permits
- 9) Assisting with erosion/sediment plan reviews and inspections of construction projects subject to Rule 5
- 10) Providing urban and conservation-related comments, recommendations, and technical assistance



to other state and federal governmental agencies

- 11) Providing technical and educational assistance, or acting in an advisory capacity to watershed or regional based initiatives
- 12) Serving as the Division's representatives in SWCD biannual reviews of operating landfills for erosion and sediment control problems



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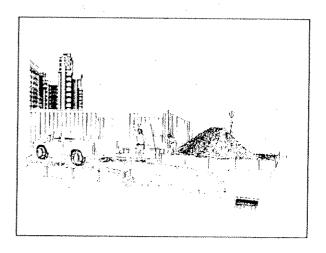
What is the Stormwater and Sediment Control Program?

Over 100 million tons of soil erodes annually from Indiana's agricultural and urban landscapes. Much of that soil enters lakes, streams, reservoirs, and rivers as sediment. Sedimentation of lakes, streams, reservoirs, and rivers results in poor water quality, diminished recreational use, reduced storage capacity, reduced floodwater retention, degradation of aquatic life, and depreciated property values.

Sediment removal, water treatment, and property repairs are costly, It's cheaper to prevent these problems than to correct them. Sensible land-use decisions, planning, and relatively inexpensive management practices can prevent, or at least minimize, the impact of many erosion and sedimentation problems.

The Division of Soil Conservation's Stormwater and Sediment Control Program's objective is to control soil erosion and sedimentation on non-farm lands, especially those undergoing development. To achieve this objective, Division of Soil Conservation staff along with their conservation partners help non-agricultural land users make wise land-use decisions, as well as select and apply appropriate conservation practices. Working primarily through Soil and Water Conservation Districts, and often in cooperation with other local, state, and federal agencies, the Division of Soil Conservation provides assistance to planners. developers, builders, contractors, engineers. surveyors, realtors, business owners, governmental units, educational institutions, and private citizens and organizations.

Stormwater and Sediment Control Program



A Component of Clean Water Indiana

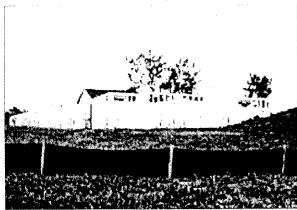


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DNR

Administered by:
Division of Soil Conservation
Indiana Department of Natural Resources
402 West Washington Street, Room W-265
Indianapolis, IN 46204-2739
317/233-3882
317/233-3882 Fax

www.state.in.us/dnr-soilcons



Silt fence captures sediment by ponding water to allow fo deposition of sediment.



Establishing vegetative cover controls soil erosion and reduces sedimentation.



Sec : > control basins retain runoff and allow sediment

Available Technical Assistance

- On-site evaluations to determine both the sources and extent of existing or potential erosion and sediment problems.
- Advise on development and application of workable solutions to existing or potential erosion and sediment problems.
- Provide technical and educational assistance, or act in an advisory capacity to watershed or regional based initiatives to further the multiple benefits of stormwater management and soil and water conservation.
- Consult with county and community governments to draft local erosion and sediment control and stormwater ordinances.
- Cooperate with the Indiana Department of Environmental Management (IDEM), implement "Rule 5" (327 IAC 15-5), a state regulation aimed at minimizing offsite water quality damages from construction site stormwater runoff.
- Assist SWCDs with erosion and sediment control plan reviews and site inspections of projects subject to "Rule 5" compliance.

Available Educational Assistance

- Program presentations on soils, the crosion process, erosion and sediment control principles and practices, and the use of conservation information and resources.
- Training on developing construction site erosion and sediment control plans, as well as selecting, installing and maintaining the appropriate control measures.
- Resources such as the "Indiana Handbook for Erosion Control in Developing Areas," a standards and specifications manual on planning and applying construction site erosion control practices; and "Erosion Confrol for the Home Builder," a pamphlet on minimizing erosion problems on individual building lots

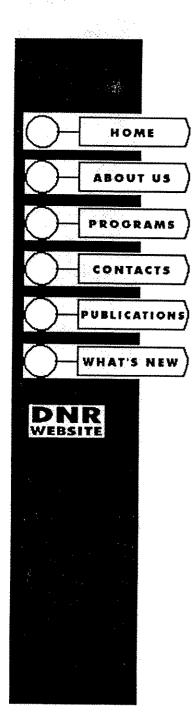
For More Information

For more information about the Stormwater and Sediment Control Program and the assistance available, contact your local Soil and Water Conservation District (SWCD), or the DNR, Division of Soil Conservation at (317) 233-3870.









Division of Soil Conservation

PROGRAM MANUAL

CLICK HERE FOR SITE MAP

DESCRIPTION OF WATERSHED DIAGNOSTIC STUDY

Goals of the study

- · Describe condition and trends in lake watershed or stream and subwatersheds
- · Identify potential problems long term resolution (5-10 yr.)
- Identify specific direction for future work
- · Predict and assess success factors for future work
- · Establish basis for submitting LARE applications for watershed land treatment.

General description of the study

The goal of the diagnostic study is to: (1) prioritize the subwatersheds according to need for agricultural soil and water conservation practices and (2) to provide a rough estimate of the extent of the need (number, overall cost, and general location of practices). Most watershed diagnostic studies cover a total area of approximately 25,000-50,000 acres with prioritization among four to ten subwatersheds. Subwatersheds are usually tributaries to the same large river system but are not necessarily adjacent to each other. Total cost for the project ranges from \$30,000 to \$40,000. The sponsoring SWCD is expected to support the project through a 5 percent cash match (e.g., \$1,500-2,000) along with a 5 percent match of in-kind services.

Mapping in most diagnostic studies includes: a land use map that distinguishes different agricultural practices (row cropping, pasture, confined feeding, forest, urban); a soils map showing highly erodible land and current vegetative cover or production type in those specific areas; identification of very serious erosion or water quality problems; and a soils map or National Wetlands Inventory map showing location of current wetlands and potential sites for wetland restoration or creation that would detain flood water or sediments and nutrients.

Much of this information can be derived from digitized or available soil surveys or aerial photographs. However, a discussion with the SWCD and some ground-truthing will be needed to locate more specific problem areas.



The use of detailed modeling procedures like AGNPS is not necessary, but a lower resolution approach to prioritizing the subwatersheds on the basis of nonpoint source pollution would be needed. This might be based on USLE-type predictions of pollutant movement as reflected by percent of land in different uses and soil erodibility in the subwatersheds in combination with comparative results of the chemical and biological stream monitoring. The use of this information provides a sound basis for submitting applications to funding programs for watershed land treatment in prioritized small watershed areas:

TYPICAL COMPONENTS OF A WATERSHED DIAGNOSTIC STUDY

Monitoring

- Water chemistry in mainstem and mouth of tributaries (nutrients, turbidity, oxygen)
- Macroinvertebrate surveys for biological monitoring (RBP II identified to family)
- Habitat assessment (QHEI)

Summary of previous studies

- Land use data (river and watershed size, number of homes, development history)
- Significant natural areas or listed species
- Fish surveys, trends, and management recommendations from DFW
- · Recreational use information (canoeing, fishing, camping)
- Volunteer monitoring data
- · Annotated bibliography of all previous studies

Land use maps

- · Subwatershed land use maps (agriculture, forest, urban, wetland) digitized, if possible
- Highly Erodible Land map
- · Wetland / hydric soils map
- · Significant natural areas map
- Streambank protection map (seawalls, erosion zones, erosion causes)
- · Potential nonpoint sources and hot spots (general, not individual properties)

Analysis and recommendations

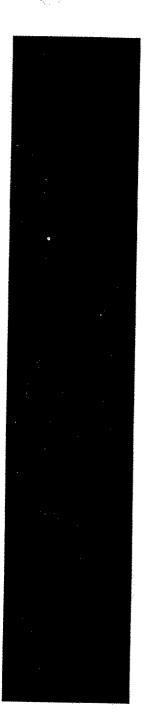
- Subwatershed modeling (relative nonpoint source contributions)
- Comparison of water quality with similar regional rivers
- · Wetland functional assessment and conservation opportunities
- Institutional assessment
- Coordinated Resource Management (CRM) recommendations
- · Volunteer monitoring groups identified or recommended
- · Watershed management and leadership resource inventory
- Prioritize project areas







in the charge



· Cost estimates and timeline

Products

- · Public information "fact sheet" or brochure
- · Public information meeting
- : Unbound photo-ready copy of report
- Digital copy of final documents, including figures, in word-processing and webready formats

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WEBMASTER: Deb Fairhurst

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BMP Cost-Share Program

Logging operations in the State of Indiana are eligible to apply for costshare dollars that will help defray the expense of BMP installations on harvest sites, depending on the location and timing of the harvest. Limitations are based on specific grant parameters and available dollars. The available cost share on each harvest operation is 75% of the actual cost of implementing the BMP's on the operation, not to exceed \$650.00.

Eligible cost-share expenses include:

- 1. man hours (planning, layout, construction)
- 2. equipment hours
- 3. supplies (mulch, seed, stone, culverts, etc)
- 4. equipment rental (timber bridge)

For more information or to receive a grant application, contact: Duane McCoy, Improved Harvesting Practices Forester, at dmccoy@dnr.state.in.us or write IHP Forester, 6220 Forest Rd., Martinsville, IN 46151 (765) 342-4026.

Go to BMP Field Guide

This page updated on June 25, 2001





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Private Landowner Assistance

Publications

State Forests

Tree Seedling Nurseries



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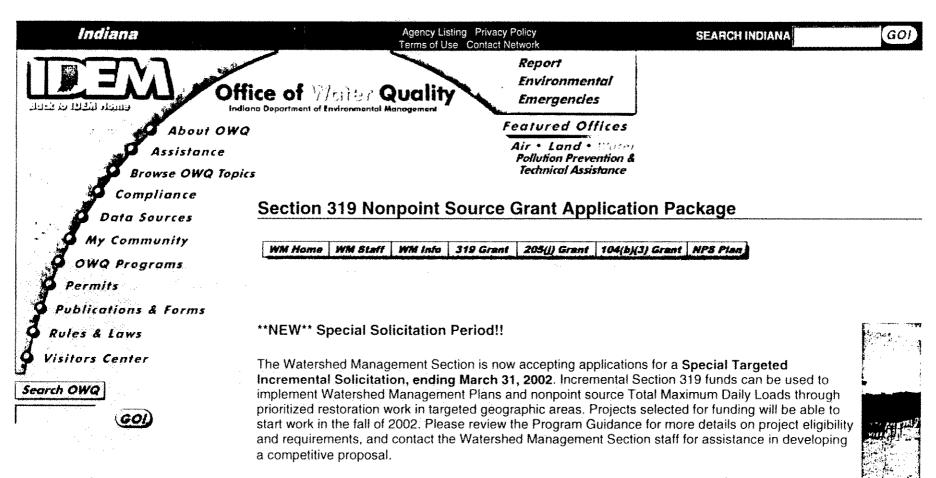
Contact Division of Forestry

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In addition to the Special Targeted Incremental Solicitation, applications for the 2003 Section 319 Grant Solicitation are due October 1, 2002. These applications are being accepted for both Base and Incremental funds. Eligible activities include education projects, research and assessment, technical assistance, planning, demonstration of new and innovative technology, development and implementation of watershed management plans, and development and implementation of nonpoint source Total I selected for funding will be able to start work July 1, 2003. Please review the Program Guidance for more details cand contact the Watershed Management Section staff for assistance in developing a competitive proposal.

Program Guidance Application Instructions

Background Information

NPS Management Objectives







U.S. EPA Section 319 Guidance Documents "What Needs to be in a 'Vatershed Management Plan" Checklist

Page URL: http://www.in.gov/idem/water/planbr/wsm/app_page.html Updated: Friday, 08-Jun-2001 09:32:55 EST

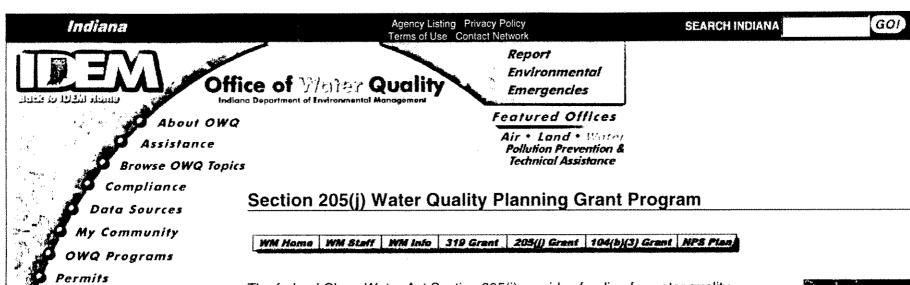
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The federal Clean Water Act Section 205(j) provides funding for water quality management planning and design. Funds are to be used to determine the nature, extent and causes of point and nonpoint source pollution problems and to develop plans to resolve these problems. Organizations eligible for funding include municipal governments, county governments, regional planning commissions, conservancy districts, irrigation/drainage districts and other public organizations. For-profit entities, nonprofit organizations, private associations and individuals are not eligible to receive this assistance.

The Section 205(j) program provides for projects that gather and map information on nonpoint source water pollution, develop recommendations for increasing the involvement of environmental and civic organizations in NPS planning, and implementation activities, and develop and implement watershed management plans.



The Watershed Management Section administers the Section 205(j) program for Indiana. For more inform please contact Bonny Elifritz at 317/234-0922 belifrit@dem.state.in.us

- o Section 205(j) Grant Application Package
- o Section 205(j) Project Management Information
- o Summary of curre <a>205(j) Grant Projects



Page URL: http://www.in.gov/idem/water/planbr/wsm/Section205j_main.html Updated: Monday, 04-Jun-2001 11:42:48 EST

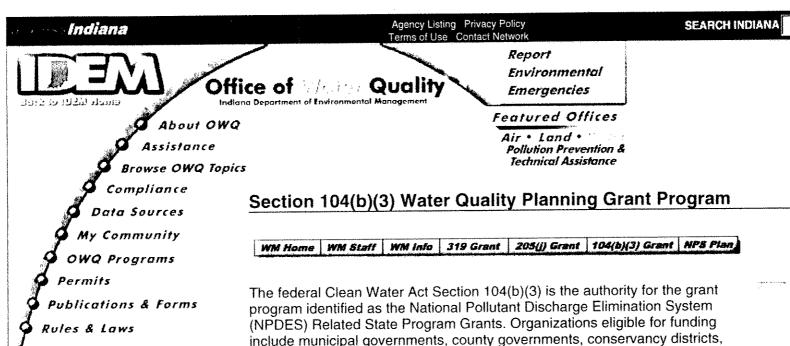
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include municipal governments, county governments, conservancy districts, irrigation/drainage districts and other public or nonprofit organizations. Forprofit entities, private associations and individuals are not eligible to receive this assistance.

The Section 104(b)(3) program provides for developing, implementing and demonstrating new concepts or requirements that will improve the effectiveness of the NPDES permit program, which regulates point source discharges of water pollution. A project proposed for assistance by this program should deal predominantly with water pollution sources and activities regulated by the NPDES program and produce a strong, beneficial value for the statewide NPDES permit program.



The Watershed Management Section administers the Section 104(b)(3) program for Indiana. For more inf funding, please contact Bonny Elifritz at 317/234-0922 belifrit@dem.state.in.us

- Description of NPDES Program
- FY2001 National Priorities for the 104(b)(3) Program
- o Section 104(b)(3) Grant Application Package





- o Section 104(b)(3) Project Management Information
- o Summary of currer : 104(b)(3) Grant Projects

Page URL: http://www.in.gov/idem/water/planbr/wsm/Section104b3_main.html Updated: Monday, 04-Jun-2001 11:42:48 EST

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Conservation Reserve Program



Overview

CRP is a voluntary program that offers long-term rental payments and cost-share assistance to establish long-term, resource-conserving cover on environmentally sensitive cropland or, in some cases, marginal pastureland. The protective cover reduces soil erosion, improves water quality, and enhances or establishes wildlife habitat. Increased rental payments are available on certain land areas (e.g., land within a wellhead protection area may receive an additional 10 percent payment).

Application Deadline(s)

- Sign up periods announced by the Secretary of Agriculture
- Enrollment is based on a competitive environmental benefits index.

Eligibility

- Land must be owned or operated for at least 12 months.
- Individuals, partnerships, associations, Indian tribal venture corporations, estates, trusts, other business enterprises or legal entities, a state, state political subdivisions, state or local agencies owning or operating land might be eligible to participate
- Land must have a minimum acceptable erodibility index, be located in an
 approved conservation priority area, have evidence of scour erosion damage, be
 a cropped wetland or cropland associated with noncropped wetlands, be land
 enrolled in the Water Bank Program (WBP) in the last year of the WBP
 agreement, or contain other environmentally sensitive land.

Assistance Provided

- Annual rental payments to each participant of up to \$50,000 per fiscal year
- Payment to participant of up to 50 percent of the cost for establishing cover
- Incentive payments for wetland hydrology restoration equal to 25 percent of the cost of restoration.

Funding Level

• Funds are available to pay to enroll up to 36.4 million acres in the Conservation Reserve at any one time through 2002, as designated by the Secretary

Legislative Authority

 Authorized by the Food Security Act of 1985, Title XII, Public Law 99-198.
 Enrollment authority extended by the Federal Agriculture Improvement and Reform Act of 1996 through 2002.

Contacts

Address Contact local or state FSA office (Appendix A)

Headquarters: U.S. Department of Agriculture,

Farm Service Agency, Conservation Reserve Program

Stop 0513, Washington, DC 20250-0513

Telephone

(202) 720-6221

E-mail

info@fsa.usda.gov

Internet

http://www.fsa.usda.gov/pas/publications/facts/pubfacts.htm

http://aspe.os.dhhs.gov/cfda/p10069.htm

Keywords

 best management practices, drinking/source water, nonpoint source control, pollution prevention, wildlife

Environmental Quality Incentives Program



Overview

The Environmental Quality Incentives Program (EQIP) was established to provide a single, voluntary conservation program for farmers and ranchers to address significant natural resource needs and objectives. Nationally, it provides technical, financial, and educational assistance, half of it targeted to livestockrelated natural resource concerns and the other half to more general conservation priorities. EQIP is available primarily in priority areas where there are significant natural resource concerns and objectives.

Application Deadline(s)

Continuous sign-up with alternating batching (ranking) periods

Eligibility

- Non-federal landowners (including American Indian tribes) engaged in livestock operations or agricultural production
- Eligible land includes cropland, rangeland, pasture, forestland, and other farm and ranch lands

Assistance Provided

- Cost sharing: Up to 75 percent of costs of certain conservation practices
- Incentive payments: Up to 100 percent for 3 years, paid at a flat rate
- Maximum \$10,000 per person per year and \$50,000 over length of contract
- NRCS awarded 24,339 contracts in FY97

Funding Level

- FY98 \$200 million
- FY99 \$174 million
- FY00 \$174 million

Legislative Authority

Food, Agriculture, Conservation, and Trade Act of 1996

Contacts

Address Contact local or state NRCS office (Appendix A)

Headquarters: U.S. Department of Agriculture

Natural Resources Conservation Service

P.O. Box 2890, Washington, DC 20013-9770

Telephone

(202) 720-1873

E-mail Internet Please contact by telephone or mail http://aspe.os.dhhs.gov/cfda/p10912.htm

http://www.nrcs.usda.gov/NRCSProg.html

Keywords

best management practices, education, floodplains and riparian zones, forests, nonpoint source control, planning, restoration, tribes, wildlife

Emergency Conservation Program



Overview

The Emergency Conservation Program (ECP) provides financial assistance to farmers and ranchers for the rehabilitation of farmlands damaged by floods, hurricanes, or other natural disasters. ECP also provides funds for carrying out emergency water conservation measures during periods of severe drought. ECP assistance is available for removing debris and restoring permanent fences, terraces, diversions, irrigation systems, and other conservation installations.

Application Deadline(s)

Sign-up periods announced by local county Farm Service Agency (FSA)
 Service Center

Eligibility

• Eligible farmers are determined by individual on-site inspections, taking into account the extent of damage and need for assistance

Assistance Provided

- Cost share: FSA pays up to 64 percent of the total cost
- Maximum \$200,000 total cost-sharing paid to an individual per disaster
- Technical assistance may be provided by USDA's Natural Resources Conservation Service

Funding Level

• Funds are appropriated by Congress, usually through supplemental appropriations in response to disasters

Legislative Authority

Agricultural Credit Act of 1978

Contacts

Address Contact local or state FSA office (Appendix A)

Headquarters: U.S. Department of Agriculture

Farm Service Agency

Stop 0513

Washington, DC 20013

Telephone

(202) 720-6221

E-mail

info@fsa.usda.gov

Internet

http://www.fsa.usda.gov/pas/publications/facts/pubfacts.htm

http://aspe.os.dhhs.gov/cfda/p10054.htm

Keywords

disaster relief





Water Quality Special Research Grants Program



Overview

This program teams the Cooperative State Research Education and Extension Service (CSREES) with multiple federal agencies. The program is targeted directly to the identification and resolution of agriculture-related degradation of water quality. Eligible proposals will provide watershed-based information that can be used to assess sources of water quality impairment in targeted watersheds; develop and/or recommend options for continued improvement of water quality in targeted watersheds; and evaluate the relative costs and benefits associated with cleanup to all responsible sectors (e.g., farming, processing, urban runoff, municipal waste treatments). The program favors proposals that have a clear problem statement and are place-based. In addition, preference is given to projects that coordinate targeted research, education, and cooperative extension activities to minimize any adverse impacts that agricultural, forest, and range management practices, food and agricultural product processing, and/or livestock production systems might have on the nation's water quality.

Application Deadline(s)

See the CSREES Web site for details (www.reeusda.gov)

Eligibility

 State/local governments and academic/nonprofit institutions located in the United States are eligible for EPA, National Science Foundation, and USDA funding. Profit-making firms and federal agencies are eligible for USDA funding.

Assistance Provided

· Project grants

Funding Level

- FY98 \$3.4 million for research; \$9.6 million for extension and outreach
- FY99 \$3.4 million for research; \$9.6 million for extension and outreach
- FY00 \$13 million (estimated): In FY00, the research and extension grant funds will be combined into one competitive program.

Legislative Authority

Water Quality Initiative of 1990

Contacts

Address U.S. Department of Agriculture

Cooperative State Research, Education and Extension Service

Ag Box 2201, Washington, DC 20250-2201

Telephone

(202) 401-5971

E-mail

mhorton@reeusda.gov

Internet

http://www.reeusda.gov

Keywords

 best management practices, nonpoint source control, point source control, pollution prevention, stormwater management

Environmental Education Grants Program



Overview

The purpose of the Environmental Education Grants (EEG) is to provide financial support for projects that design, demonstrate, or disseminate environmental education practices, methods, or techniques. Projects must focus on one of the following: (1) improving environmental education teaching skills: (2) educating teachers, students, or the public about human health problems; (3) building state, local, or tribal government capacity to develop environmental education programs; (4) educating communities through community-based organization; or (5) educating the public through print, broadcast, or other media.

Application Deadline(s)

Mid-November

Eligibility

 Local, tribal, or state education agencies, colleges and universities, nonprofit organizations, state environmental agencies, and noncommercial education broadcasting agencies

Assistance Provided

- Project grants (up to \$25,000 regionally; \$25,000 to \$150,000 nationally)
- Non-federal government match of 25 percent is required
- In FY99, the following number of grants were awarded: 150 for \$5,000, 50 for \$5,000-\$25,000, and 9 for \$100,000.

Funding Level

- FY98 \$3 million
- FY99 \$2.4 million
- FY00 \$2 million (anticipated)

Legislative Authority

National Environmental Education Act, Public Law 101-619, sec. 6

Contacts

Address U.S. Environmental Protection Agency

Office of Environmental Education (1704)

Environmental Education Grants

Ariel Rios Bldg., 1200 Pennsylvania Ave., NW,

Washington, DC 20460

Telephone

(202) 260-8619

E-mail

Please contact by telephone or mail

Internet http://ww

http://www.epa.gov/enviroed/grants.html http://aspe.os.dhhs.gov/cfda/p66951.htm

Keywords

education, outreach, pollution prevention

Forestry Incentives Program



Overview

The Forestry Incentives Program (FIP) is intended to ensure the nation's ability to meet future demand for sawtimber, pulpwood, and quality hardwoods. FIP provides cost-share monies to help with the costs of tree planting, timber stand improvements, and related practices on nonindustrial private forestlands. In addition to ensuring a future supply of timber, FIP's forest maintenance and reforestation projects provide numerous natural resource benefits, including reduced soil erosion and wind and enhanced water quality and wildlife habitat.

Application Deadline(s)

Varies. Contact local or state NRCS office.

Eligibility

- Private landowner of at least 10 acres and no more than 1,000 acres of
 nonindustrial forest or other suitable land. Individuals, groups, Indian tribes or
 other native groups, associations, and corporations whose stocks are not
 publicly traded might be eligible provided they are not engaged primarily in
 the business of manufacturing forest products or providing public utility
 services.
- Land must be suitable for conversion from nonforest to forestland, for reforestation, or for improved forest management. Land must be capable of producing marketable timber crops and must meet productivity standards.

Assistance Provided

 FIP provides no more than 65 percent of the total costs, with a maximum of \$10,000 per person per year. NRCS awarded 3,877 contracts in FY98.

Funding Level

- FY98 \$6.3 million
- FY99 \$16.3 million
- FY00 \$6.3 million

Legislative Authority

- Cooperative Forestry Assistance Act of 1978, Public Law 95-313
- Food, Agriculture, Conservation, and Trade Act of 1996

Contacts

Address Contact local or state NRCS office (Appendix A)

Headquarters: U.S. Department of Agriculture Natural Resources Conservation Service P.O. Box 2890, Washington, DC 20013

Telephone

(202) 720-6521

E-mail

robert.molleur@usda.gov

Internet

http://www.nhq.nrcs.usda.gov/OPA/FB96OPA/FIPfact.html

http://aspe.os.dhhs.gov/cfda/p10064.htm

Keywords

forests, restoration

Watershed Protection and Flood Prevention Program



Overview

Also known as the "Small Watershed Program" or the "Pl. 566 Program," this program provides technical and financial assistance to address resource and related economic problems on a watershed basis. Projects related to watershed protection, flood prevention, water supply, water quality, erosion and sediment control, wetland creation and restoration, fish and wildlife habitat enhancement, and public recreation are eligible for assistance. Technical and financial assistance is also available for planning and installation of works of improvement to protect, develop, and use land and water resources in small watersheds.

Application Deadline(s)

• Eligible project sponsors may submit formal requests for assistance to the NRCS state Conservationist in each state at any time.

Eligibility

Local or state agency, county, municipality, town or township, soil and water
conservation district, flood prevention/flood control district, Indian tribe or
tribal organization, or other subunit of state government with the authority
and capacity to carry out, operate, and maintain installed works of
improvement. Projects are limited to watersheds containing ≤ 250,000 acres.

Assistance Provided

 Technical assistance and cost sharing (amount varies) for implementation of NRCS-authorized watershed plans. Technical assistance on watershed surveys and planning. Although projects vary significantly in scope and complexity, typical projects entail \$3.5 million to \$5 million in federal financial assistance.

Funding Level

- FY98 \$99.4 million
- FY99 \$99.4 million
- FY00 \$99.4 million (estimated)

Legislative Authority

- Watershed Protection and Flood Prevention Act, Public Law 83-566
- Flood Control Act of 1944, Public Law 78-534

Contacts

For funding information contact state NRCS office (Appendix A)

Headquarters: Department of Agriculture Natural Resources Conservation Service

P.O. Box 2890

Washington, DC 20013-9770

Telephone

(202) 720-3534

E-mail

Address

rcollett@usda.gov.

Internet

http://www.ftw.nrcs.usda.gov/programs.html

http://aspe.os.dhhs.gov/cfda/p10904.htm

Keywords

 best management practices, floodplains and riparian zones, nonpoint source control, outreach, planning, pollution prevention, wetlands, wildlife

Wetlands Reserve Program



Overview

This voluntary program provides landowners with financial incentives to restore and protect wetlands in exchange for retiring marginal agricultural land. Landowners may sell a conservation easement or enter into a cost-share restoration agreement. Landowners voluntarily limit future use of the land, but retain private ownership. Landowners and the Natural Resources Conservation Service develop a plan for the restoration and maintenance of the wetland.

Application Deadline(s)

Continuous sign-up

Eligibility

- Easement participant must have owned the land for at least 1 year. Owner may be an individual, partnership, association, corporation, estate, trust, business, or other legal entity; a state (when applicable); a political subdivision of a state; or any agency thereof owning private land.
- Land must be restorable and be suitable for wildlife benefits.

Assistance Provided

WRP provides three options to the landowner:

- Permanent Easement: USDA purchases easement (price is lesser of the appraised agricultural or raw land value, payment cap, or amount offered by the landowner). USDA pays 100 percent of restoration costs.
- 30-year Easement: Easement payment will be 75 percent of what would be paid for a permanent easement. USDA pays 75 percent of restoration costs.
- Restoration Cost-Share Agreement: Agreement (min. 10 yr) to restore degraded wetland habitat. USDA pays 75 percent of restoration costs.

Funding Level

The program requires acreage authorization levels, not funding levels. Funds are provided to meet acreage levels. Authorizations include: FY98—212,000 acres; FY99—120,000 acres; and FY00—150,000 acres.

Legislative Authority

- Food Security Act of 1985, Title XII, Public Law 99-198, as amended
- Food, Agriculture, Conservation, and Trade Act of 1996

Contacts

Address Contact local or state NRCS office (Appendix A)

Headquarters: U.S. Department of Agriculture Natural Resources Conservation Service Watersheds and Wetlands Division P.O. Box 2890, Washington, DC 20013

Telephone (20

(202) 690-0848

E-mail

robert.misso@usda.gov http://www.wl.fb-net.org

Internet

http://aspe.os.dhhs.gov/cfda/p10072.htm

Keywords

 disaster relief, easements, floodplain and riparian zones, land acquisition, nonpoint source control, planning, restoration, wetlands, wildlife

Watershed Assistance Grants



Overview

Today's water quality challenges include habitat loss and nonpoint source pollution from urban, rural, and rapidly growing areas. This pollution impacts the quality of surface and ground water supplies, many of which serve as drinking water sources. Solving such challenges requires partnerships and community-led solutions. To address this need, EPA establishes a cooperative agreement with one or more nonprofit organization(s) or other eligible entities to support watershed partnership organizational development and long-term effectiveness. Funding supports organizational development and capacity building for watershed partnerships with diverse membership.

Application Deadline(s)

• Varies

Eligibility

• Nonprofits, tribes, and local governments.

Assistance Provided

• Grants (match is encouraged but not required)

Funding Level

- FY98 \$0.3 million
- FY99 \$0.5 million
- FY00 \$0.6 million (estimated)

Maximum funds for individual watershed partnership: \$30,000

Legislative Authority

Clean Water Act, section 104(b)(3)

Contacts

Address U.S. Environmental Protection Agency

Office of Wetlands, Oceans and Watersheds (4501F) Ariel Rios Bldg., 1200 Pennsylvania Ave., NW,

Washington, DC 20460

Telephone

(202) 260-4538

E-mail

cole.james@epa.gov

Internet :

http://www.epa.gov/owow/wag.html

Keywords

• drinking/source water, education, monitoring, outreach, partnerships, planning, pollution prevention, restoration

Nonpoint Source Implementation Grants (319 Program)



Overview

The 319 program provides formula grants to the states and tribes to implement nonpoint source projects and programs in accordance with section 319 of the Clean Water Act (CWA). Nonpoint source pollution reduction projects can be used to protect source water areas and the general quality of water resources in a watershed. Examples of previously funded projects include installation of best management practices (BMPs) for animal waste; design and implementation of BMP systems for stream, lake, and estuary watersheds; basinwide landowner education programs; and lake projects previously funded under the CWA section 314 Clean Lakes Program.

Application Deadline(s)

Consult the lead nonpoint source (NPS) agency in your state.

Eligibility

Applicant

Lead state and territorial NPS agencies and eligible tribes

Beneficiary

State and local governments; Indian tribes, nonprofit organizations (may submit applications to states for funds in

accordance with the state's work program)

Assistance Provided

- Formula grants are awarded to a lead agency in each state and territory.
 Eligible tribes may also receive funds
- States/tribes/local organizations are usually required to provide 40 percent of total project or program cost

Funding Level

- FY98 \$105 million
- FY99 \$200 million
- FY00 \$200 million

Legislative Authority

Clean Water Act, section 319(h)

Contacts

Address

U.S. Environmental Protection Agency Office of Wetlands, Oceans and Watersheds Nonpoint Source Control Branch (4503F)

Ariel Rios Bldg., 1200 Pennsylvania Ave., NW,

Washington, DC 20460

Telephone

(202) 260-7100

E-mail

ow-general@epa.gov

Internet

http://aspe.os.dhhs.gov/cfda/p66460.htm

http://www.epa.gov/owow/NPS

Keywords

drinking/source water, nonpoint source control, restoration

Wetlands Program Development Grants



Overview

The Wetlands Program Development Grants provide financial assistance to states, federally-recognized Indian tribes, and local governments to support development of new, or augmentation and enhancement of existing wetland programs. Projects must clearly demonstrate a direct link to an increase in the state's, tribe's, or local government's ability to protect its wetland resources.

Application Deadline(s)

Varies by EPA region. Refer to Internet site for deadlines and regional contact information (http://www.epa.gov/owow/wetlands/2000grant/).

Eligibility

- States
- Federally recognized Indian tribes
- Local governments
- Intergovernmental organizations

Assistance Provided

- Project grants are used to fund individual projects
- Recipients must provide a 25 percent match of the total project cost
- EPA awarded 160 grants in FY98, ranging from \$10,000 to \$500,000

Funding Level

- FY98 \$15 million
- FY99 \$15 million
- FY00 \$15 million

Legislative Authority

Clean Water Act, Public Law 92-500, section 104(b)(3), 33 U.S.C. 1254(b)(3)

Contacts

Contact regional office (Appendix A) or Address

U.S. Environmental Protection Agency Office of Wetlands, Oceans and Watersheds

Wetlands Division (4502F),

Ariel Rios Bldg., 1200 Pennsylvania Ave., NW,

Washington, DC 20460

Telephone

Please contact EPA regional wetland coordinator (Appendix A)

Hotline

(800) 832-7828 (contractor operated)

E-mail

wetlands-hotline@epa.gov (contractor operated)

Internet

http://www.epa.gov/OWOW/wetlands/2000grant/

http://aspe.os.dhhs.gov/cfda/p66461.htm

Keywords

coastal waters, data analysis, education, enforcement/compliance, floodplains and riparian zones, forests, monitoring, nonpoint source control, outreach, planning, restoration, tribes, wetlands, wildlife





Water and Waste Disposal Systems for Rural Communities



Overview

This program provides monies to provide basic human amenities, alleviate health hazards and promote the orderly growth of the rural areas of the nation by meeting the need for new and improved rural water and waste disposal facilities. Funds may be used for the installation, repair, improvement, or expansion of a rural water facility including costs of distribution lines and well pumping facilities. Funds also support the installation, repair, improvement, or expansion of a rural waste disposal facility, including the collection and treatment of sanitary waste stream, stormwater, and solid wastes.

Application Deadline(s)

Contact state office

Eligibility

Municipalities, counties, and other political subdivisions of a state (such as
districts), and authorities, associations, cooperatives, non-profit corporations,
and federally recognized Indian tribes

Assistance Provided

- Project grants (617 grants awarded in FY98, ranging from \$3,000 to \$4.1 million)
- Direct loans (774 loans awarded in FY98, ranging from \$5,000 to \$7.3 million)
- Guaranteed/insured loans (9 guaranteed/insured loans awarded in FY98)

Funding Level

- FY98 \$790 million in loans, \$522 million in grants, and \$75 million in guaranteed loans
- FY99 \$706 million in loans, \$528 million in grants, and \$75 million in guaranteed loans
- FY00 \$780 million in loans, \$477 million in grants, and \$75 million in guaranteed loans

Legislative Authority

 Consolidated Farm and Rural Development Act, section 306, Public Law 92-419, 7 U.S.C. 1926

Contacts

Address Please contact state or local office (Appendix A)

Headquarters: U.S. Department of Agriculture

Rural Utilities Service, Water and Environmental Programs

Room 4050-S, Stop 1548 1400 Independence Avenue, SW, Washington, DC 20250

1400 Independen

Telephone (202) 690-2670 E-mail Please contact h

Please contact by telephone or mail

Internet

http://www.usda.gov/rus/water/programs.htm http://aspe.os.dhhs.gov/cfda/p10760.htm

Keywords

· economic development, solid waste, stormwater management, wastewater

Public Works and Development Facilities Program



Overview

This program provides assistance to help distressed communities attract new industry, encourage business expansion, diversify local economies, and generate long-term, private sector jobs. Among the types of projects funded are water and sewer facilities, primarily serving industry and commerce; access roads to industrial parks or sites; port improvements; business incubator facilities; technology infrastructure; sustainable development activities; export programs; brownfields redevelopment; aquaculture facilities; and other infrastructure projects. Specific activities may include demolition, renovation, and construction of public facilities; provision of water or sewer infrastructure; or the development of stormwater control mechanisms (e.g., a retention pond) as part of an industrial park or other eligible project.

Application Deadline(s)

 Applications are accepted on a continuous basis and are processed as funds become available. Funding information appears annually in the Federal Register.

Eligibility

- States, political subdivisions of a state, Indian tribes, special-purpose state/local government units; or public or private nonprofit organizations
- Proposed projects must be consistent with an approved regional Comprehensive Economic Development Strategy (CEDS)
- EDA evaluates proposals and invites formal applications

Assistance Provided

Project grants. Average FY98 grant: \$859,443

Funding Level

- FY98 \$177.9 million
- FY99 \$205.9 million
- FY00 \$205.9 million (estimated)

Legislative Authority

 Economic Development Administration Reform Act (Public Law 105-393), which replaces and amends the Public Works and Economic Development Act of 1965

Contacts

Address Contact EDA regional office (Appendix A)

Headquarters: U.S. Department of Commerce

Economic Development Administration, Public Works Division 14th Street and Constitution Ave., NW, Washington, DC 20230

Telephone

(202) 482-5268

E-mail Internet

Please contact by telephone or mail http://aspe.os.dhhs.gov/cfda/p11300.htm

http://www.doc.gov/eda/

Keywords

disaster relief, drinking/source water, economic development, fishery, pollution prevention, stormwater management, tribes, wastewater



Sustainable Development Challenge Grants



Overview

Grants are intended to initiate community-based projects that promote environmentally and economically sustainable development. The program encourages partnering among community, business, and government entities to work cooperatively to develop flexible, locally oriented approaches that link environmental management and quality of life activities with sustainable development and revitalization. This program challenges communities to invest in a sustainable future that will link environmental protection, economic prosperity, and community well-being. These grants are intended to (1) catalyze community-based projects; (2) build partnerships that increase a community's capacity to take steps to ensure long-term ecosystem and human health, economic vitality, and community well-being; and (3) leverage public and private investments to enhance environmental quality by enabling community efforts to continue beyond the period of funding.

Application Deadline(s)

Fall

Eligibility

- · Nonprofit organizations and community groups
- Federally recognized Indian tribes, state and local governments

Assistance Provided

- Project grants (45 grants awarded in FY98, ranging from \$28,000 to \$200,000)
- 20 percent match required

Funding Level

- FY98 \$5 million
- FY99 \$4.7 million
- FY00 \$0 (check Internet site for future funding status)

Legislative Authority

Multiple authorizations, including:

Clean Water Act, sec. 104(b)(3); Clean Air Act, sec. 103(b)(3); Resource
Conservation and Recovery Act, sec. 8001; Toxics Substances Control Act,
sec. 10; Pollution Prevention Act, sec. 6605; Safe Drinking Water Act, sec.
1442(a) and (c); Federal Insecticide, Fungicide, and Rodenticide Act, sec. 20;
National Environmental Education Act, sec. 6

Contacts

Address U.S. Environmental Protection Agency,

SDCG, Office of the Administrator (MC 1306) Ariel Rios Bldg., 1200 Pennsylvania Ave., NW,

Washington, DC 20460

Telephone

(202) 260-6812

E-mail

desautels.lynn@epa.gov

Internet

http://aspe.os.dhhs.gov/cfda/p66651.htm http://www.epa.gov/ecocommunity/sdcg/

Keywords

 drinking/source water, economic development, education, forests, partnerships, planning, pollution prevention, restoration, wetlands, wildlife

Water Quality Cooperative Agreements



Overview

Grants are provided to support the creation of unique and new approaches to meeting stormwater, sanitary sewer, and combined sewer outflows, biosolids, and pretreatment requirements, as well as enhancing state capabilities. Eligible projects include research, investigations, experiments, training, demonstrations, surveys, and studies related to the causes, effects, extent, and prevention of pollution.

Application Deadline(s)

· Applications accepted on an ongoing basis

Eligibility

• State water pollution control agencies, interstate agencies, local public agencies, Indian tribes, nonprofit institutions, organizations, and individuals

Assistance Provided

- Grants; a match is encouraged
- Headquarters and regional EPA offices awarded a total of 170 grants in FY98, including provision of additional funds for ongoing projects

Funding Level

- FY98 \$19 million
- FY99 \$19 million
- FY00 \$19 million

Legislative Authority

• Clean Water Act, section 104(b)(3)

Contacts

Address U.S. Environmental Protection Agency

Office of Wastewater Management (4203) Ariel Rios Bldg., 1200 Pennsylvania Ave., NW,

Washington, DC 20460

Telephone

(202) 260-9545

E-mail

benroth.barry@epa.gov

Internet

http://www.epa.gov/owm/wm042000.htm

Keywords

 best management practices, education, mining, monitoring, nonpoint source control, planning, point source control, pollution prevention, stormwater management, tribes, wastewater

Flood Mitigation Assistance Program

FEMA

Overview

The Flood Mitigation Assistance (FMA) program helps states and communities identify and implement measures to reduce or eliminate the long-term risk of flood damage to homes and other structures insurable under the National Flood Insurance Program (NFIP). Projects may include (1) elevation, relocation, or demolition of insured structures; (2) acquisition of insured structures and property; (3) dry floodproofing of insured structures; (4) minor, localized structural projects that are not fundable by state or other federal programs (erosion-control and drainage improvements); and (5) beach nourishment activities such as planting of dune grass.

Application Deadline(s)

Established by states

Eligibility.

- State agencies, participating NFIP communities, or qualified local organizations
- Communities that have been suspended from the NFIP are not eligible

Assistance Provided

Two types of grants are available:

- Planning grants. Assist communities with the development of Flood Mitigation plans (assessment of flood risk and identification of actions needed to reduce risk). Communities must have Flood Mitigation Plans to be eligible for FMA project grants.
- Project grants. For implementation of measures to reduce flood losses.

Funding Level

- FY98 \$20 million (cap)
- FY99 \$20 million (cap)
- FY00 \$20 million (cap) (estimated)

Legislative Authority

National Flood Insurance Reform Act of 1994, 42 U.S.C 4101

Contacts

Address

Contact regional office (Appendix A)

Headquarters: Federal Emergency Management Agency

Mitigation Directorate

500 C Street, SW, Washington, DC 20472

Telephone

(202) 646-4621

E-mail

Please contact by telephone or mail

Internet

http://www.fema.gov/home/MIT/fmasst.htm

Keywords

 best management practices, coastal waters, disaster relief, floodplains and riparian zones, land acquisition, planning, restoration, stormwater management, wetlands

Hazard Mitigation Grant Program

FEMA

Overview

This program helps states and communities implement long-term hazard mitigation measures following a major disaster declaration. The program's objectives are to prevent or reduce the loss of life and property from natural hazards, to implement state or local hazard mitigation plans, to enable mitigation measures to be implemented during immediate recovery from a disaster, and to provide funding for previously identified mitigation measures that benefit the disaster area. Eligible projects include the elevation, relocation, acquisition, or demolition of structures that will reduce future losses.

Application Deadline(s)

• 18 months after disaster declaration

Eligibility

- State and local governments, certain private nonprofit organizations or institutions, and Indian tribes or authorized tribal organizations and Alaska native villages or organizations
- Project must be in a previously declared (by the President) disaster area

Assistance Provided

• Project grants (match of funds or in-kind services required). FEMA can fund up to 75 percent of total eligible costs.

Funding Level

The following funding levels represent the money available for FEMA's Disaster Assistance (DA) Program. Hazard Mitigation, a subprogram within DA, receives a portion of the money for grants. A community in a disaster area receives an additional 15 percent of its total disaster funds to spend on hazard mitigation.

- FY98 \$415 million
- FY99 \$216 million
- FY00 funding levels will depend on disaster declarations

Legislative Authority

 Robert T. Stafford Disaster Relief and Emergency Assistance Act (section 404), as amended by the Hazard Mitigation and Relocation Assistance Act of 1993

Contacts

Address Contact regional office (Appendix A)

Headquarters: Federal Emergency Management Agency

Mitigation Directorate

500 C Street, SW, Washington, DC 20472

Telephone

(202) 646-4621

E-mail

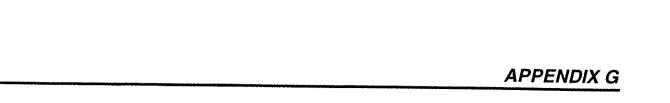
Please contact by telephone or mail

Internet

http://www.fema.gov

Keywords

· disaster relief, floodplains and riparian zones, land acquisition, planning



FLOOD MITIGATION ASSISTANCE

provides funding to assist States and communities in implementing measures to reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes, and other structures insurable under the National Flood Insurance Program (NFIP).

FMA was created as part of the

National Flood Insurance Reform Act of 1994

(42 U.S.C. 4101) with the goal of reducing or eliminating claims under the NFIP.

FMA is a pre-disaster grant program.

For information on hose to apply for an FMA grant, contact your State FMA Point of Contact (POC):

Jan Crider 317-232-3833

email jerider@sema.state.in.us

Or call the nearest FEMA Regional Office for the name of your State's POC:

FEMA Region 1 (CT, ME, MA, NH, RI, VT) Boston, MA

Phone: (617) 223-9561

FEMA Region II

(NJ, NY, PR, VI) New York, NY Phone: (212) 225-7200

FEMA Region III (DC, DE, MD, PA, VA, WV) Philadelphia, PA

Phone: (215) 931-5528 FEMA Region IV

(AL, FL, GA, KY, MS, NC, TN, SC) Atlanta, GA Phone: (770) 220-5406

FEMA Region V (IL, IN, MI, MN, OH, WI) Chicago, IL Phone: (312) 408-5500 FEMA Region VI (AR, LA, NM, OK, TX) Denton, TX Phone: (817) 898-5127

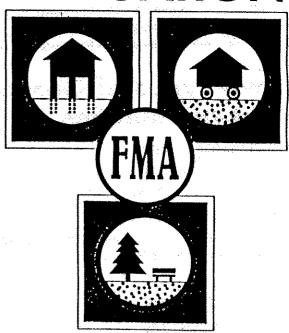
FEMA Region VII (IA, KS, MO, NE) Kansas City, MO Phone: (816) 283-7002

FEMA Region VIII (CO, MT, ND, SD, UT, WY) Denver, CO Phone: (303) 235-4830

FEMA Region IX (AZ, CA, HI, NV, GU, AS, CNMI) San Francisco, CA Phoue: (415) 923-7186

FEMA Region X (AK, ID, OR, WA) Bothell, WA Phone: (206) 487-4678

FLOOD MITIGATION



ASSISTANCE



Gei...ng Started

Planning is the foundation of FMA. FEMA encourages communities to identify ways to reduce their risk of flood damage by preparing Flood Mitigation Plans.

Communities that have Flood Mitigation Plans can request approval of their plans from their FMA-State Point of Contact (POC) and FEMA. Approved plans make a community eligible to apply for FMA project grants. Plans must assess flood risk and identify actions to reduce that risk.

Two Types of Grants to Communities

- Planning Grants
 Grants to States and communities to develop or update Flood Mitigation Plans.
- Project Grants
 Grants to States and communities to implement measures to reduce flood losses.

Examples of Eligible Projects

Projects that reduce the risk of flood damage to structures insurable under the National Flood Insurance Program (NFIP) are eligible. Such activities include:

- Elevation of insured structures.
- Acquisition of insured structures and real property.
- · Relocation or demolition of insured structures.
- Dry floodproofing of insured structures.

- Minor, localized structural projects that are not fundable by State or other Federal programs.
- Beach nourishment activities such as planting of dune grass.

Applicant Eligibility

Any State agency, participating NFIP community, or qualified local organization is eligible to participate in FMA. Communities that are suspended or on probation from the NFIP are not eligible.

Individuals wishing to participate in FMA should contact their community officials.

Project Grant Eligibility Criteria

A project must, at a minimum, be:

- · Cost effective.
- Cost beneficial to the National Flood Insurance Fund.
- Technically feasible.
- Physically located in a participating NFIP community or must reduce future flood damages in an NFIP community.

A project must also conform with:

- The minimum standards of the NFIP Floodplain Management Regulations.
- The applicant's Flood Mitigation Plan.
- All applicable laws and regulations, such as Federal and State environmental standards or local building codes.

How FMA Works

FEMA distributes FMA funds to States, which in turn provide funds to communities. The State serves as the grantee and program administrator for the FMA. The State:

- * Sets mitigation priorities.
- Provides technical assistance to communities applying for FMA funds.
- Evaluates grant applications based on minimum eligibility criteria and State priorities.
- · Awards planning grants.
- Works with FEMA to approve projects and awards funds to communities.
- Ensures that all community applicants are aware of their grant management responsibilities.

Cost-Share and Funding Limits

FEMA may contribute up to 75 percent of the total eligible costs. At least 25 percent of the total eligible costs must be provided by a nonfederal source. Of this 25 percent, no more than half can be provided as in-kind contributions from third parties. There are limits on the frequency of grants and the amount of funding that can be allocated to a State or community in any 5-year period.

Federal Emergency Management Agency Regional Offices

FEMA Region I
J.W. McCormeck Post Office &
Courthhouse Building, Room 442
Boston, MA. 02109-4595
Phone: (617) 233-9540
Fax: (617) 223-9519
(CT,ME,MA,NH,RI,VT)

FEMA Region II
26 Federal Plaza
Room 1337
New York, NY 10278-0002
Phone: (212) 225-7209
Fax: (212) 225-7281
(NJ,NY,PR,VI)

FEMA Region III
Liberty Square Building
105 South Seventh Street
Philadelphia, PA 19106-3316
Phone: (215) 931-5608
Fax: (215) 931-5513
IDC,DE,MD,PA,VA,WV)

FEMA Region IV 1371 Peachtree Street, N.E. Suite 700 Atlanta, GA 30309-3108 Phone: (404) 853-4200 Fax: (404) 853-4230 (AL,FL,GA,KY,MS,NC,SC,TN)

FEMA Region V 175 W. Jackson Boulevard Fourth Floor Chicago, IL 60604-2698 Phone: (312) 408-5501 Fax: (312) 408-5234 (IL,IN,MI,MN,OH,WI)

Regional Offices (Continued)

FEMA Region VI Federal Regional Center 800 N. Loop 288 Denton, TX 76201-3698 Phone: (817) 898-5104 Fax: (817) 898-5325 (AR,LA,NM,OK,TX)

FEMA Region VII
2322 Grand Boulevard
Suite 900
Kansas City, MO 64108-2670
Phone: (816) 283-7061
Fax: (816) 283-7852
(IA,KS,MO,NE)

FEMA Region VIII
Denver Federal Center
Building 710
Box 25267
Denver, CO 80225-0267
Phone: (303) 235-4812
Fax: (303) 235-4976
(CO,MT,ND,SD,UT,WY)

FEMA Region IX
Building 105
Presidio of San Francisco
San Francisco, CA 94129
Phone: (415) 923-7100
Fax: (415) 923-7112
(AZ,CA,HI,NV,Pacific Trust Territories)

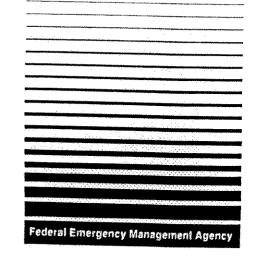
FEMA Region X
Federal Regional Center
130 228th Street, S.W.
Bothell, WA 98021-9796
Phone: (206) 487-4604
Fax: (206) 487-4622
(AK,ID,OR,WA)





L-169/February 1996

Hazard Mitigation Grant Program



Hazard Mitigation

This brochure is designed to answer common questions about the Federal Emergency Management Agency's (FEMA) Hazard Mitigation Grant Program.

What is the Hazard Mitigation Grant Program?

The Hazard Mitigation Grant Program (HMGP) was created in November 1988, by Section 404 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act. The HMGP assists States and local communities in implementing long-term hazard mitigation measures following a major disaster declaration. In December 1993, the President signed the Hazard Mitigation and Relocation Assistance Act which amends Section 404 to increase Federal funding of HMGP projects to 75 percent of the project's total eligible costs. For disasters declared before June 10, 1993, the Federal share for the program is 50 percent.

What is the Hazard Mitigation Grant Program?

The Program's objectives are:

- To prevent future losses of lives and property due to disasters;
- To implement State or local Hazard Mitigation plans;
- To enable mitigation measures to be implemented during immediate recovery from a disaster; and
- To provide funding for previously identified mitigation measures that benefit the disaster area.

Who is eligible?

Applicant eligibility is the same for the Hazard Mitigation Grant Program as it is for the Public Assistance Program. Applicants who are eligible for the HMGP are:

- State and local governments;
- Certain private non-profit organizations or institutions; and
- Indian tribes or authorized tribal organizations and Alaska Native villages or organizations.

What types of projects can be funded?

The HMGP can be used to fund projects to protect either public or private property. Examples of projects include:

- Structural hazard control, such as debris basins or floodwalls;
- Retrolitting, such as floodproofing to protect structures from future damage;
- Acquisition and relocation of structures from hazard -prone areas; and
- Development of State or local standards to protect new and substantially improved structures from disaster damage.

How do I apply?

Eligible applicants must apply for the Hazard Mitigation Grant Program through the State, since the State is responsible for administering the Program. The applicant should contact the State Hazard Mitigation Officer for specific details. Every State must develop a Hazard Mitigation Administrative Plan that explains the State's procedures for administering the HMGP.

What is the deadline for applying for funds?

The State must submit a letter of intent to FEMA to participate in the HMGP within 60 days of the disaster declaration. Applications for mitigation projects are encouraged as soon as possible after the disaster occurs so that opportunities to do mitigation are not lost during reconstruction. All new project proposals must be submitted for approval within 90 days after FEMA approves the State's hazard mitigation plan for the disaster.

You should contact your State Hazard Mitigation Officer for specific application dates.

How much money is available in the HMGP?

FEMA can fund up to 75% of the eligible costs of each project. The State or local match does not need to be cash; in-kind services or materials may be used. With the passage of the Hazard Mitigation and Relocation Assistance Act of 1993, Federal funding under the HMGP is now based on 15% of the Federal funds spent on the Public and Individual Assistance programs (minus administrative expenses) for each disaster.

How are potential projects identified and selected for funding?

The State's administrative plan governs how projects are selected for funding. However, proposed projects must meet certain minimum criteria. These criteria are designed to ensure that the most cost-effective and appropriate projects are selected for funding. Both the law and the regulations require that the projects are part of an overall miligation strategy for the disaster area.

How does the HMGP differ from mitigation funded under the Public Assistance Program?

Mitigation projects may also be identified and funded through FEMA's Public Assistance Program after a disaster declaration. Public Assistance funds allow an existing damaged lacility to incorporate mitigation measures during repairs, if the measures are cost-effective or are required by code. These potential measures can be identified by either FEMA, the State, or the local applicant.

Mitigation funded under Public Assistance is only for public facilities damaged by the disaster. The HMGP can fund mitigation measures to protect public or private property, so long as these measures fit within the overall mitigation strategy for the disaster area, and comply with program guidelines. For public property damaged in the disaster, it is more appropriate to fund mitigation measures under Section 406 before applying to the HMGP.

Where can I obtain further information?

Regulations for the HMGP are published in Title 44 of the Code of Federal Regulations, Part 206, Subpart N: Detailed information about applying for and managing the Program can be found in FEMA's HMGP Interim Guidance handbook.

For copies of the handbook or further information, contact your State Hazard Mitigation Officer or the FEMA Mitigation Division in your Region. A listing of FEMA's Regional Offices is printed on the back of this brochure.





LAKE LEMON SEDEMENTATION/RESTORATION PROJECT SUMMARY December 18, 2001

Lake Lemon is located northeast of Bloomington, Indiana on the Monroe County/Brown County border. Lake Lemon was once the water supply reservoir for the City of Bloomington and is currently being used for recreational purposes. It is also a valuable natural resource for aquatic and wildlife habitat. The east end of the lake has undergone significant degradation to siltation, impacting wildlife, aquatic life, and recreational uses at the lake.

The Lake Lemon Conservancy District obtained a grant in late 1999. The purpose of the grant was to fund a project that would yield a design approach and initial design documents. The ultimate use of the design would be a construction project to achieve the following goals:

- A. Address existing sedimentation at the east end of the reservoir and purpose a method to deal with future sedimentation.
- B. Improve the water quality in the reservoir by relocating existing sediments.
- Restore fish and wildlife habitat.
- Address navigational concerns by improving the current channel and reopening the original channel.

Numerous meetings were held between the Lake Lemon Conservancy District representatives and The Schneider Corporation, as well as meetings with the Department of Natural Resources and The Indiana Department of Environmental Management. These meetings and discussions yielded six key project strategies, which are as follows:

- A. Define options to achieve the project goals.
- B. Evaluate options that could be implemented in a single year or in a multi-year project.
- C. Define the sedimentation limits and project a sedimentation rate per year.
- D. Use islands located in the current areas of sedimentation to minimize the amount of sediment that would have to be relocated.
- E. Stabilize channel locations and shapes.
- F. Develop a design to capture more of the sediment in one location at the east end of the reservoir.



Exhibit "A" represents a visual representation of the sedimentation, which has occurred in the east end of the reservoir. The Schneider Corporation took over forty (40) soil borings within the sedimentation area at the east end of the reservoir to determine the depth of the sediments. In addition, over 1,500 separate elevation measurements where taken to determine the existing elevations of the sediment deposited in the reservoir as of the year 2000. Exhibit "B" shows the locations of the borings.

The borings and elevations were used to determine that approximately 520,000 c.y. of sediments has accumulated in the east end of the reservoir. Some of the sediment deposits likely existed prior to the reservoir but do not represent a significant amount in our opinion. Based upon the current 50-year life of the reservoir, it appears that sediment is deposited at a rate of 8,000 to 10,000 c.y. per year. All options considered to address overall sedimentation problems will have have a sedimentation basin with a capacity to hold between 8 and 10 years of sediment at the rates described above.

Three basic options were developed that could relocate the sediment and improve water quality and recreational uses at the east end of the lake. An analysis was performed on each of these basic project approaches.

OPTION #1

Option #1 would create slightly submerged islands out of dredged materials at the east end of the reservoir. These materials would be placed inside a riprap containment dike. Exhibit "C" graphically presents this option and Exhibit "F" gives the preliminary cost summary for the option.

OPTION #2

Option #2 creates elevated islands with suitable interior wetlands using a fiberglass piling containment system similar to that currently being used around the lake. Exhibit "D" graphically presents this option and Exhibit "F" presents the cost information for Option #2.

OPTION #3

Option #3 would relocate all sediment defined in the field investigations to three (3) separate areas. These areas are a little used portion of the lake south of the causeway, Little Africa, and Bloomington property along North Shore Drive. Exhibit "E" identifies the area where sediment would be relocated. Wetlands could be located in any of the three (3) locations by controlling topography and the depth of the sediment placed in each area. Exhibit "F" presents the cost information for Option #3.

Exhibit "G" summarizes the cost for each of the options and summarizes how each option achieves the goals and strategies developed for the project. Option #2 clearly presents the most viable option for implementation on the project. In addition to the cost and achieved goal superiority, Option #2 also moves the least amount of sediment, has the least impact on surrounding property, and reserves the areas defined in Option #3 for future placement of sediment.

Lake Lemon Sedementation/Restoration Project Summary Page Three

Option #1 is the next most cost-effective approach but does not quite achieve all of the goals. One of the challenges of improving habitat is controlling the American lotus, which has established itself at the east end of the reservoir. Option #1 does not significantly change the conditions of existing sedimentation area. The American lotus can easily reestablish itself. Furthermore, the wave action that will occur in Option #1 would make it very difficult to establish other wetland species.

Option #3 does not achieve all of the goals and only somewhat restores the habitat. Option #3 relocates the most amount of sediment, which would also have the greatest environmental impact.

In summary, the proposed project will implement Option #2 roughly as shown in Exhibit "H". Preliminary detail construction drawings have been prepared and will be used along with this summary by the Lake Lemon Conservancy District to accomplish the four remaining steps:

- A. Obtaining the necessary permits from State and perhaps, Federal agencies.
- B. Finalizing construction documents.
- C. Obtaining funding for the project.
- D. Implementation of the project, either in a single project or multi-year project program.

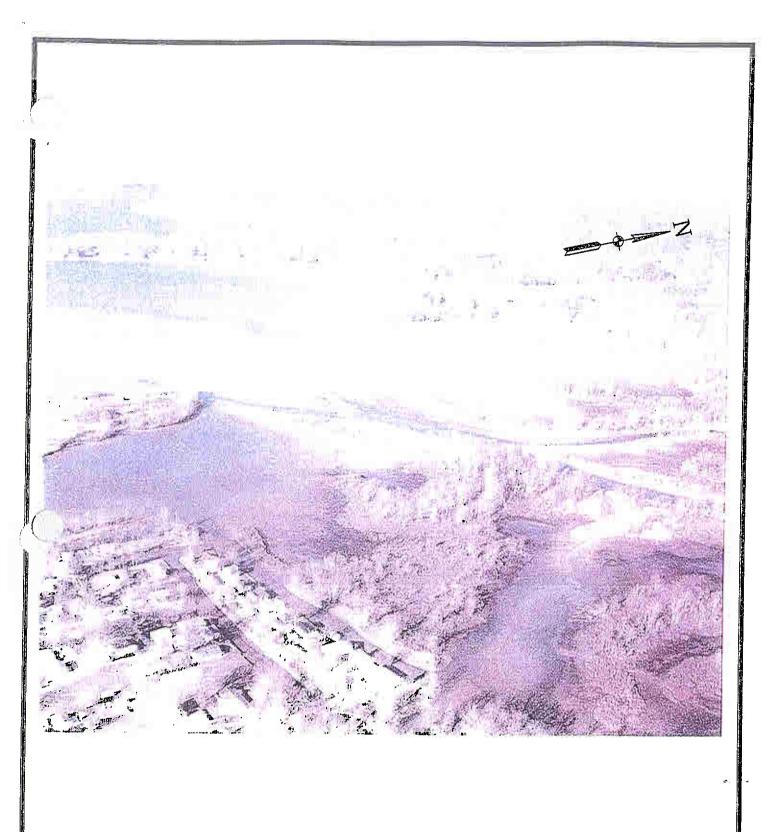




EXHIBIT A EXISTING CONDITIONS LAKE LEMON-UNIONVILLE, IN Project No. 2764.001

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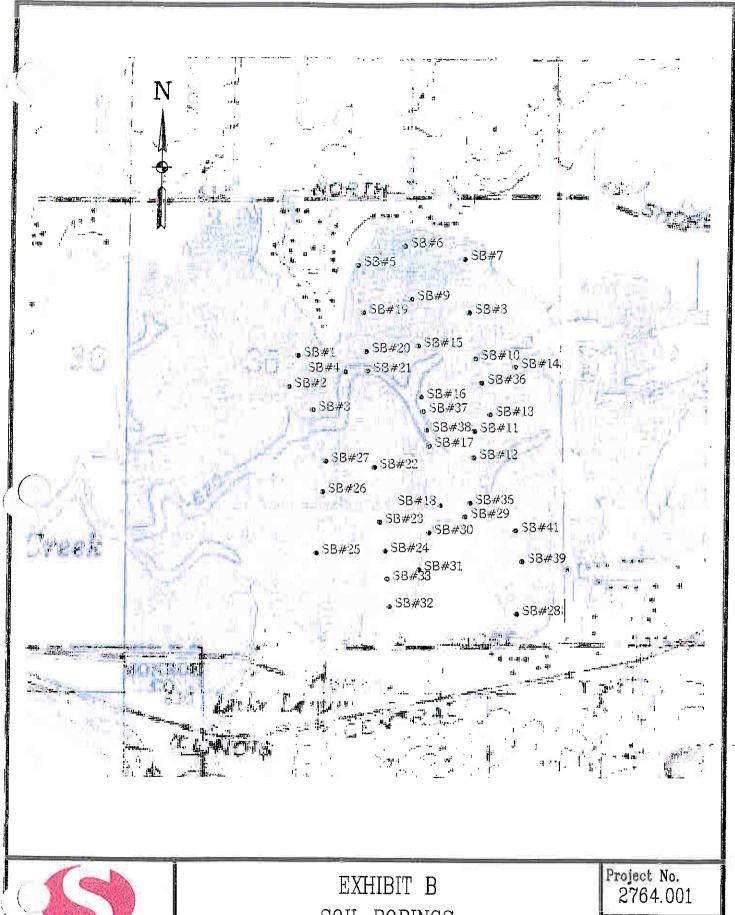




EXHIBIT B
SOIL BORINGS
LAKE LEMON-UNIONVILLE, IN

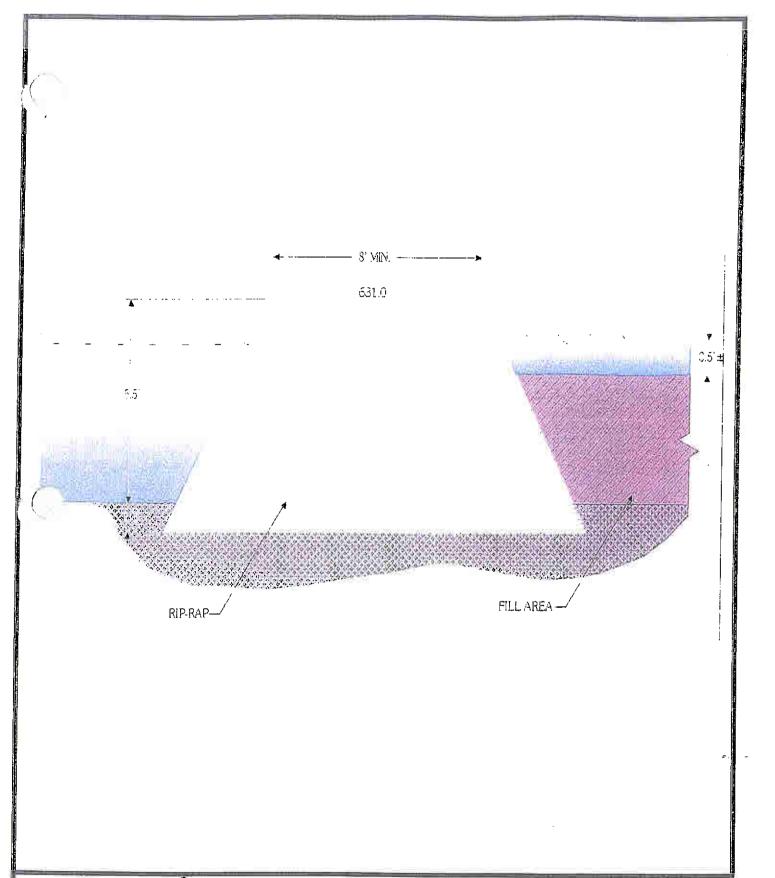




EXHIBIT C OPTION 1 — RIP-RAP LAKE LEMON-UNIONVILLE, IN Project No. 2764.001

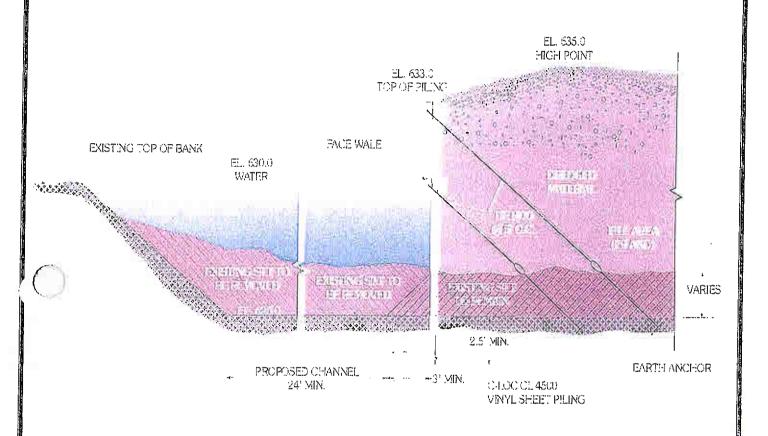




EXHIBIT D
OPTION 2 — PILING
LAKE LEMON-UNIONVILLE, IN

Project No. 2764.001

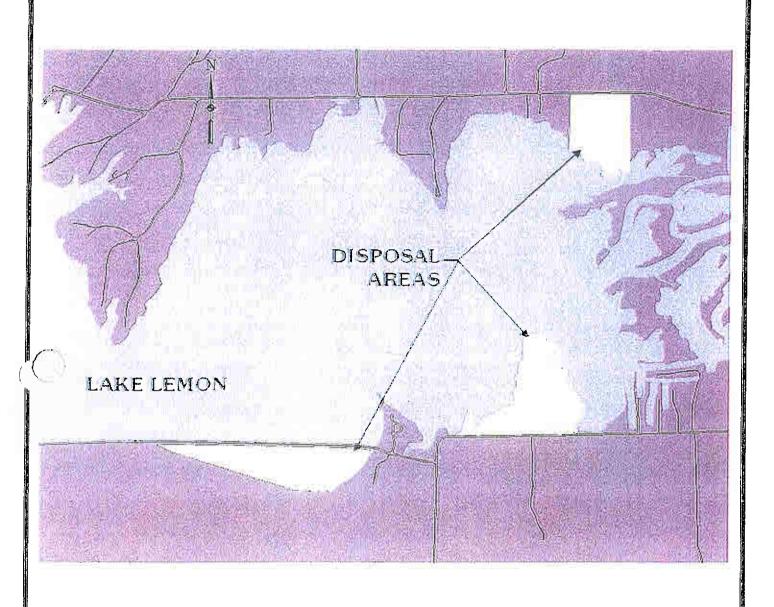




EXHIBIT E
OPTION 3 — DISPOSAL AREA
LAKE LEMON-UNIONVILLE, IN

Project No. 2764.001

OPT 1	QUANITY	UNITS	UNIT COST	TOTAL
MOBILIZATION AND DEMOBILIZATION	1	EΑ	\$185,000.00	\$185,000
DREDGING	350,000	CY	\$3.00	\$1,050,000
RIP-RAP	28,500	CY	\$25.00	\$712,500
OFFSITE DISPOSAL	205,000	CY	\$1.00	\$205,000
TOTAL				\$2,152,500
CONTINGENCY @ 109	%			\$215,250
TOTAL				\$2,367,750
ENGINEERING, LEGA	L, ETC. @ 20%			\$473,550
TOTAL				\$2,841,300

OPT 2	QUANITY	UNITS	UNIT COST	TOTAL
MOBILIZATION AND DEMOBILIZATION	1	EA	\$185,000.00	\$185,000
DREDGING	350,000	CY	\$3.00	\$1,050,000
PILING	6,500	LF	\$75.00	\$487,500
TOTAL				\$1,722,500
CONTINGENCY @ 10°	%			\$172,250
TOTAL				\$1,894,750
ENGINEERING, LEGA	L, ETC. @ 20%			\$378,950
TOTAL				\$2,273,700

ОРТЗ	QUANITY	UNITS	UNITCOST	TOTAL
MOBILIZATION AND DEMOBILIZATION	1	EΑ	\$185,000,00	\$185,000
DREDGING	605,000	CŸ	\$3.00	\$1,815,000
OFFSITE DISPOSAL	605,000	CY	\$1.00	\$605,000
TOTAL				\$2,605,000
CONTINGENCY @ 10	%			\$260,500
TOTAL				\$2,865,500
ENGINEERING, LEGA	L, ETC. @ 20%			\$573,100
TOTAL				\$3,178,100



EXHIBIT F
COST TABLES
LAKE LEMON-UNIONVILLE, IN

Project No. 2764.001

O	ption E	valuatio	n
	1	2	3
Improve Water Quality	X	X	X
Restore Habitats	X	X	Somewhat
Improve Navigation	X	X	X
Stabilizes Channel Sides	X	X	
Multi-Year Schedule	X	X	Somewhat
Create Sedimentation Basin	X	X	X
Use Island Approach	Somewhat	X	

OPTION 1	\$2,841,300
A STATE OF THE STA	
OPTION 2	\$2,273,700
OPTION 3	\$3,178,100



EXHIBIT G OPTION EVALUATION & COST SUMMARY LAKE LEMON-UNIONVILLE, IN

Project No. 2764.001

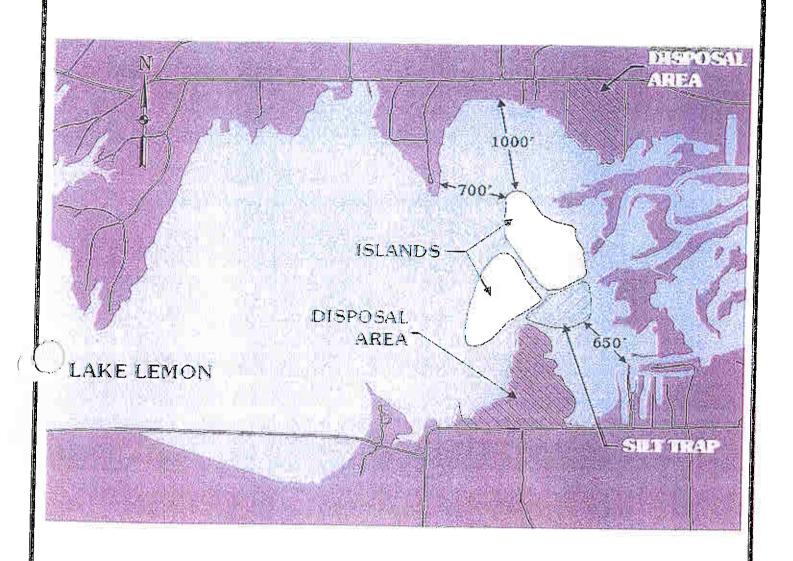
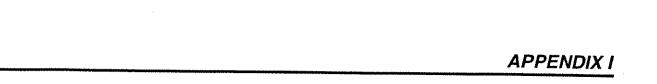




EXHIBIT H
PROPOSED IMPROVEMENTS
LAKE LEMON-UNIONVILLE, IN

Project No. 2764.001



EAST END DESIGN STUDY

Presentation by Cecil Whitaker, Schneider Engineering December 18, 2001 at 7:00 p.m. Brown County Public Library

(Copies of Mr. Whitaker's presentation are available at the LLCD office)

Summary:

Sedimentation inputs from Bean Blossom Creek are slowing filling in the east end of Lake Lemon. Without some type of management plan, the lake will fill in much faster than under normal biological processes.

Schneider Engineering took over 40 soil samples and over 1500 elevation measurements in the east end to determine the extent of sedimentation since the lake's formation. They determined approximately 520,000 cubic yards of sediment has accumulated in the east end. The rate of sedimentation is about 8,000 to 10,000 cubic yards per year.

They propose three different approaches to remove existing sediment and control future sedimentation.

- 1. Create slightly submerged islands or wetland areas from dredged materials using a riprap perimeter.
- 2. Create elevated islands with suitable interior wetlands using a fiberglass piling containment.
- 3. Relocate sediment to one of three proposed areas: an area south of the causeway; Little Africa; or City of Bloomington property on North Shore Drive.

Costs for the three approaches are \$2,841,300; \$2,273,780; and \$3,178,100 respectively. Option 2 is the most cost effective and also accomplishes all of the pre-determined goals established before the study began.

Future steps include acquiring the required permits, creating construction documents, finding adequate funding, and implementing one of the above plans. LLCD will begin locating funding sources and researching required permits.

If you have any questions or comments about the recommendations proposed by Schneider Engineering, please do not hesitate to call the office and we will try to answer your questions and make note of comments.

Thank you, Angie Smith Lake Biologist

Lake Lemon Sedimentation/Restoration Project Lake Lemon Conservancy District

Project Goals

- Address existing sedimentation at the east end of the reservoir and propose methods to address future sedimentation.
- Improve the water quality in reservoir.
- Restore fish and wildlife habitat.
- Address navigational concerns by improving the current channel and reopening the original channel.

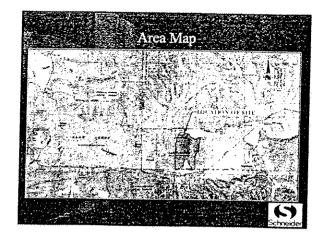


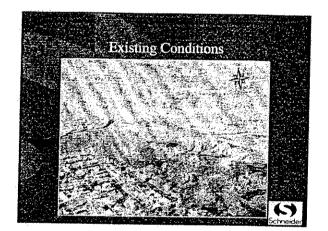
Key Project Strategies

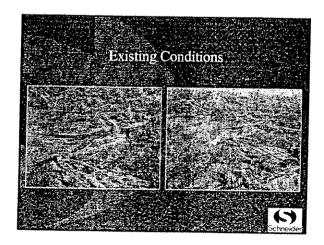
- Define options to achieve the project goals. Evaluate options that could be implemented in a single year or a multi-year project
- Define sedimentation limits and project a sedimentation rate per year.

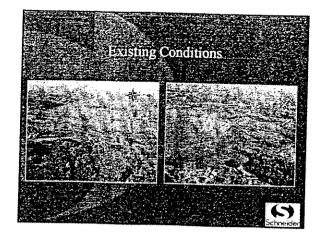
- Use islands to minimize earthwork
 Stabilize channel locations and shapes
 Develop a basin to capture more sediment at one location in the east end.







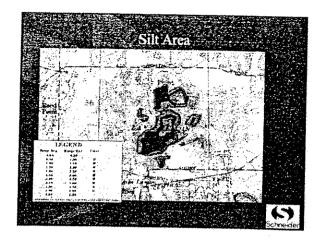




🖟 - Field Investigations

- Over 40 soil borings were taken within the sedimentation area at the east end of the reservoir to determine the depth of the sediments.
 Over 1500 separate elevation measurements were taken to determine the amount of sediment deposited in the reservoir as of the year 2000.

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Sedimentation Information

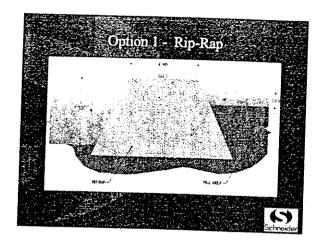
- Approximately 520,000 cubic yards (cy) of sediments have accumulated in the east end of the reservoir.
- Some sediment deposits likely existed prior to the reservoir but cannot be quantified.
- The rate of sedimentation is likely 8,000 to
- 10,000 cy/yr.
 The sedimentation basin will hold between 8 and 10 years of sediment.

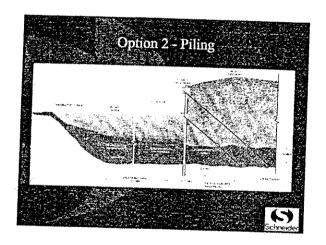
Basic Options

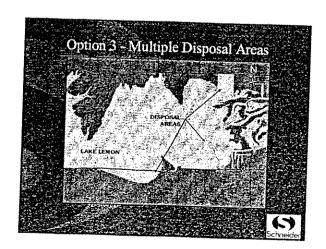
- I+ Create slightly submerged islands from dredged materials for wetlands using riprap perimeter containment.
- 2 Create elevated islands with suitable interior wetlands using a fiberglass
- piling containment.

 3. Relocate sediment to an area south of the causeway. Little Africa, and Bloomington property on North Shore Drive

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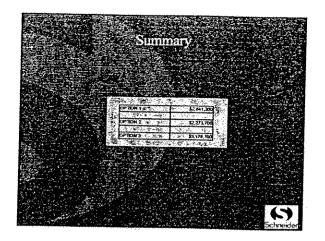


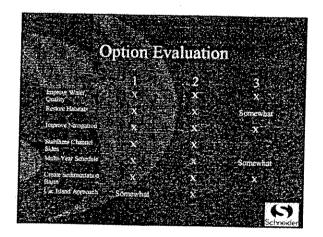
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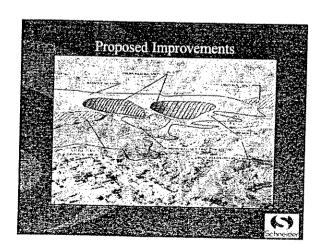
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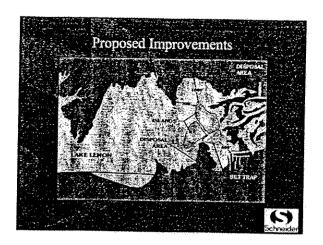
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Future Steps • Permitting. • Construction documents. • Funding. • Implementation.